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ABSTRACT

This curriculum guide in agricultural resources is one of 10 guides developed as part of a vocational project stressing agribusiness, natural resources, and environmental protection. The scope of this guide includes eight occupational subgroups: fish, forestry, mining area restoration, outdoor recreation, soil, range, water, and wildlife. It is meant as an aid to all who are involved in the curriculum planning phases prior to classroom instruction. Each unit has seven elements to be used for developing specific curriculum and curriculum materials: unit concept, student performance objectives, instructional areas, examples of learning activities, examples of evaluation processes, instructional materials or equipment, and references. Appendixes list recommended materials and equipment, additional references, and selected professional and technical societies. (Author/JC)

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Career Preparation in

AGRICULTURAL RESOURCES

A Curriculum Guide

For High School Vocational Agriculture

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OTHER CURRICULUM MATERIALS [illegible] BY THIS PROJECT INCLUDE:

CAREER AWARENESS IN AG[illegible]SS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION: A CURRICULUM GUIDE FOR GRADES K-6.

CAREER EXPLORATION IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION: A CURRICULUM GUIDE FOR GRADES 7-9.

CAREER PREPARATION IN AGRICULTURAL PRODUCTION: A CURRICULUM GUIDE FOR HIGH SCHOOL VOCATIONAL AGRICULTURE.

CAREER PREPARATION IN AGRICULTURAL SUPPLIES AND SERVICES: A CURRICULUM GUIDE FOR HIGH SCHOOL VOCATIONAL AGRICULTURE.

CAREER PREPARATION IN AGRICULTURAL EQUIPMENT AND MECHANICS: A CURRICULUM GUIDE FOR HIGH SCHOOL VOCATIONAL AGRICULTURE.

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CAREER PREPARATION IN ENVIRONMENTAL PROTECTION: A CURRICULUM GUIDE FOR HIGH SCHOOL VOCATIONAL AGRICULTURE.

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BY

OHIO CAREER EDUCATION AND CURRICULUM
MANAGEMENT LABORATORY IN AGRICULTURAL EDUCATION
THE OHIO STATE UNIVERSITY
COLUMBUS, OHIO 43210
1974

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FOREWORD

THIS SUGGESTED CURRICULUM GUIDE IN AGRICULTURAL RESOURCES IS ONE OF TEN GUIDES DEVELOPED UNDER THE DIRECTION OF THE OHIO CAREER EDUCATION AND CURRICULUM MANAGEMENT LABORATORY, DEPARTMENT OF AGRICULTURAL EDUCATION, COLLEGE OF AGRICULTURE, THE OHIO STATE UNIVERSITY, AS A PART OF THE PROJECT ENTITLED "CURRICULUM DEVELOPMENT BASIC TO THE TRAINING OF INDIVIDUALS FOR EMPLOYMENT IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION." THE PROJECT WAS FUNDED UNDER A CONTRACT WITH THE BUREAU OF OCCUPATIONAL AND ADULT EDUCATION, U.S. OFFICE OF EDUCATION.

THE PROJECT GREW OUT OF THE NEED TO IDENTIFY THE EDUCATIONAL EXPERIENCES MOST APPROPRIATE FOR CAREER DEVELOPMENT IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION. EDUCATORS WERE LACKING ADEQUATE AND ACCURATE INFORMATION FOR THE CAREER AWARENESS AND EXPLORATION STAGES OF THE CAREER DEVELOPMENT PROCESS CONCERNING THE AGRIBUSINESS COMPLEX.

THE AGRIBUSINESS COMPLEX ALSO HAD SEVERAL EMERGING PROGRAM AREAS WHERE OCCUPATIONAL COMPETENCIES AND THE RELATED CURRICULUM HAD NOT BEEN WELL DEFINED AT THE VOCATIONAL PREPARATION LEVEL. THESE CONDITIONS CAUSED APPROPRIATE CAREER DEVELOPMENT PROGRAMS TO BE LACKING OR INEFFECTIVE AT ALL LEVELS, LEADING UP TO AND INCLUDING VOCATIONAL EDUCATION, BECAUSE GUIDANCE IN MATERIALS AND PROCESSES OF CONDUCTING THESE PROGRAMS WERE NOT ADEQUATELY DEVELOPED.

IN MAY OF 1971, AGRICULTURAL LEADERS REPRESENTING STATE SUPERVISORS, TEACHER EDUCATORS, CLASSROOM TEACHERS AND THE AGRICULTURAL BUSINESS AND INDUSTRIAL COMMUNITY MET IN DENVER, COLORADO, TO DISCUSS THE CHANGING NATURE OF THE FIELD. THERE WAS GENERAL AGREEMENT THAT THE DEVELOPING EMPHASIS ON AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CALLED FOR MAJOR CURRICULUM CHANGES AND DEVELOPMENT OF NEW CURRICULA, WITH CHANGES IN THE PREPARATION OF AGRICULTURAL EDUCATION PERSONNEL AT THE SAME TIME.

THE PURPOSES OF THIS PROJECT WERE: (1) TO DEVELOP APPROPRIATE CURRICULUM GUIDES IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION WHICH PROVIDE A COORDINATED EDUCATIONAL PROGRAM, INCLUDING CAREER AWARENESS, CAREER EXPLORATION AND PREPARATION FOR A CLUSTER OF OCCUPATIONS; (2) TO ACQUAINT EDUCATIONAL LEADERSHIP IN ALL STATES WITH THE CURRICULUM MATERIALS FROM THIS PROJECT AND PROMOTE THEIR USE; AND (3) TO DISSEMINATE COPIES OF THE CURRICULUM MATERIALS TO LEADERS OF EACH STATE.

ACKNOWLEDGEMENTS

THIS CURRICULUM GUIDE WAS DEVELOPED BY LARRY HOUSEHOLDER, CURRICULUM SPECIALIST ASSOCIATE, DEPARTMENT OF AGRICULTURAL EDUCATION, THE OHIO STATE UNIVERSITY, WITH ASSISTANCE FROM THE STAFF OF THE OHIO CAREER EDUCATION AND CURRICULUM MANAGEMENT LABORATORY IN AGRICULTURAL EDUCATION AND THE PROJECT ADVISORY COMMITTEES FOR ASSISTANCE IN PLANNING AND REVIEWING THE GUIDES. APPRECIATION IS ALSO EXTENDED TO DR. ELIZABETH J. SIMPSON, BRANCH CHIEF, CURRICULUM DEVELOPMENT BRANCH, DIVISION OF RESEARCH AND DEMONSTRATION, BUREAU OF OCCUPATIONAL AND ADULT EDUCATION, AND TO THE LATE DR. PHILLIP TESKE, PROJECT OFFICER, U.S. OFFICE OF EDUCATION, BUREAU OF OCCUPATIONAL AND ADULT EDUCATION, FOR THEIR DIRECTION DURING THE PREPARATION OF THIS GUIDE. ALSO, GRATITUDE IS EXTENDED TO THE TEACHERS AND INDUSTRY PERSONNEL WHO HAVE GIVEN TIME FROM THEIR JOBS TO ASSIST IN A CRITIQUE OF THE GUIDES.

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AGRICULTURAL RESOURCES

The Use of This Curriculum Guide

THERE IS LESS THAN FULL AGREEMENT ON JUST WHAT CONSTITUTES A PARTICULAR TYPE OF CURRICULUM DOCUMENT. THE CURRICULUM GUIDE IS NO EXCEPTION. THE FOLLOWING IS NOT MEANT AS AN EFFORT TO DEBATE CURRICULUM TERMINOLOGY FURTHER, BUT RATHER TO CLARIFY HOW THIS DOCUMENT CAN BE USED MORE EFFECTIVELY FOR ITS INTENDED PURPOSE.

ENTITLED A CURRICULUM GUIDE, IT IS DESIGNED TO ANSWER THE MORE BASIC QUESTIONS OF CURRICULUM PLANNING AND DEVELOPMENT - WHAT SHOULD BE TAUGHT AND, TO SOME DEGREE, HOW AND WITH WHAT RESOURCES. IT IS NOT INTENDED TO TEACH FROM NOR TO BE USED AS INSTRUCTIONAL MATERIAL IN THE CLASS BY EITHER TEACHER OR STUDENTS.

IT IS MEANT AS AN AID TO ALL WHO ARE INVOLVED IN THE CURRICULUM PLANNING PHASES PRIOR TO CLASSROOM INSTRUCTION. FOR ADMINISTRATORS AND OTHERS WHO MUST MAKE DECISIONS CONCERNING FACILITIES OR EQUIPMENT, THERE ARE GUIDELINES TO BOTH SPECIFICATIONS AND OVERALL COST RANGES. FOR GUIDANCE COUNSELORS OR OTHERS WORKING WITH STUDENTS ON CAREER DECISIONS, INFORMATION IS PROVIDED CONCERNING OCCUPATIONS AND THE TYPE OF COMPETENCIES AND CHARACTERISTICS NEEDED BY THE WORKERS FOR THESE OCCUPATIONS. FOR THE CURRICULUM SPECIALIST, TEACHER EDUCATOR, STATE SUPERVISOR OR OTHERS RESPONSIBLE FOR DETERMINING INSTRUCTIONAL CONTENT AND PREPARING TEACHERS TO CONDUCT INSTRUCTIONAL PROGRAMS, THE GUIDE DEFINES THE NEEDS OF THE STUDENTS IN TERMS OF TERMINAL PERFORMANCES. ALL OTHER ASPECTS OF CURRICULUM CONTENT, TEACHING PROCESSES AND INSTRUCTIONAL RESOURCES ARE BASED UPON THE TERMINAL PERFORMANCE OBJECTIVES FOR THE STUDENTS.

THE SCOPE OF THE GUIDE INCLUDES EIGHT OCCUPATIONAL SUBGROUPS WITHIN THE AGRICULTURAL RESOURCES AREA. THESE ARE CONSISTENT WITH AND CODED AS DEFINED IN THE STANDARD TERMINOLOGY FOR CURRICULUM AND INSTRUCTION IN LOCAL AND STATE SCHOOL SYSTEMS. THE OVERALL AREA OF AGRICULTURAL RESOURCES IS GIVEN THE DESIGNATION 01.06 00 00 00. THE OCCUPATIONAL SUBGROUPS HAVE THE FOLLOWING DESIGNATIONS:

FISH	01.06 07 00 00
FORESTRY	01.06 01 00 00
MINING AREA RESTORATION	01.06 99 00 00
OUTDOOR RECREATION	01.06 02 00 00
SOIL	01.06 02 00 00
RANGE	01.06 08 00 00
WATER	01.06 05 00 00
WILDLIFE	01.06 04 00 00

THE OCCUPATIONS CONSIDERED IN THESE EIGHT SUBGROUPS ARE LIMITED TO THOSE ON THE CAREER LADDER FOR WHICH HIGH SCHOOL VOCATIONAL INSTRUCTION IS EITHER NECESSARY OR SIGNIFICANTLY DESIRABLE. THE UNITS WITHIN THE GUIDES ARE BUILT UPON MINIMUM LEVEL OF COMPETENCIES FOR ENTRY LEVEL JOBS. HOWEVER, IT IS ASSUMED THAT, EVEN THOUGH STUDENTS MUST BEGIN AT THIS ENTRY LEVEL JOB, MANY WILL SOON BE STRIVING TO ADVANCE. WHENEVER THE EMPLOYEE IS PRESENTED WITH OTHER DESIRABLE JOB OPPORTUNITIES, IT IS INTENDED THAT HIS VOCATIONAL INSTRUCTION WILL HELP HIM MASTER EARLY JOB OPPORTUNITY ADVANCES IN AN EFFICIENT MANNER.

SOME STATES HAVE PROVIDED THAT APPROXIMATELY 2,000 HOURS BE USED DURING THE JUNIOR AND SENIOR YEARS FOR INSTRUCTION, LABORATORY AND COOPERATIVE ON-THE-JOB EXPERIENCE IN A SPECIALIZED AGRICULTURAL RESOURCES PROGRAM. WHILE THIS GUIDE MAY NOT COVER ALL POSSIBLE INSTRUCTIONAL SEQUENCES, THERE IS LIKELY MORE INCLUDED IN THIS GUIDE THAN WOULD BE USED IN ANY ONE PROGRAM INVOLVING 2,000 HOURS. IT IS INTENDED THAT THE USERS OF THIS GUIDE WILL SELECT THOSE INSTRUCTIONAL AREAS TO BUILD AN INSTRUCTIONAL PACKAGE WHICH MOST APPROPRIATELY MEETS THE STUDENTS' NEEDS IN THAT STATE OR LOCALITY.

BECAUSE MANY AGRICULTURAL RESOURCES PROGRAMS ACROSS THE COUNTRY ARE SIMILAR OR, AT LEAST, HAVE MANY COMMON AREAS IN THE CURRICULUM, CONSIDERABLE REDUNDANCY OF EFFORT OCCURS AS THESE PROGRAMS ARE PLANNED AND DEVELOPED. IN PREPARING THIS GUIDE, A MAJOR CONCERN HAS BEEN TO IDENTIFY THOSE PERFORMANCE OBJECTIVES WHICH ARE COMMON TO ALL OR TO A LARGE PROPORTION OF THE PROGRAMS. THOSE WHICH ARE ONLY APPROPRIATE TO LIMITED LOCALITIES HAVE NOT BEEN INCLUDED.

IT IS INTENDED THAT THE OBJECTIVES STATED IN THIS GUIDE WOULD SAVE TIME AND EFFORT FOR STATE PERSONNEL WHO HAVE THE RESPONSIBILITY FOR DEFINING THE OCCUPATIONAL COMPETENCIES IN AGRICULTURAL RESOURCES.

ONCE THE OBJECTIVES FROM THE GUIDE WHICH ARE COMMON TO THE STATE CURRICULUM NEEDS ARE DEFINED, THEY COULD BE USED TO FACILITATE STATING MORE SPECIFIC LEVELS OF OBJECTIVES. OR, IF OTHER OBJECTIVES ARE MORE APPROPRIATE, THEY COULD BE SUBSTITUTED FOR THOSE PRESENTED, AS STATE OR LOCAL CONDITIONS WARRANTED.

Organization of Instructional Units

THIS CURRICULUM GUIDE IS COMPOSED OF UNITS OF INSTRUCTION. EACH UNIT IS DEVELOPED AROUND A CLOSELY-RELATED GROUP OF PERFORMANCE OBJECTIVES WHICH ARE BASIC TO THE TRAINING OF INDIVIDUALS FOR ENTRY LEVEL SKILLED EMPLOYMENT IN AGRICULTURAL RESOURCES OCCUPATIONS. THE UNITS ARE ORGANIZED INTO EIGHT AGRICULTURAL RESOURCES OCCUPATIONAL AREAS OF FISH, FORESTRY, MINING AREA RESTORATION, OUTDOOR RECREATION, SOIL, RANGE, WATER AND WILDLIFE.

THE INSTRUCTIONAL UNITS ARE BASED UPON THE COMPETENCIES OF ENTRY LEVEL SKILLED OCCUPATIONS IN AGRICULTURAL RESOURCES. MOST OF THE PERFORMANCE OBJECTIVES FOR THE UNITS ARE COMMON TO AGRICULTURAL RESOURCES PROGRAMS.

Format of the Units of Instruction

EACH OF THE UNITS OF INSTRUCTION HAS SEVEN ELEMENTS TO BE USED FOR DEVELOPING SPECIFIC CURRICULUM AND CURRICULUM MATERIALS. THE LIST OF ELEMENTS INCLUDES:

1. UNIT CONCEPT
2. STUDENT PERFORMANCE OBJECTIVES
3. INSTRUCTIONAL AREAS
4. EXAMPLES OF STUDENT LEARNING ACTIVITIES
5. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCES
6. INSTRUCTIONAL MATERIALS OR EQUIPMENT
7. EXAMPLES OF SUPPORTING REFERENCES

A DESCRIPTION OF THE SEVEN ELEMENTS OF THE UNITS OF INSTRUCTION

UNIT CONCEPT

THE UNIT CONCEPT DEFINES THE RATIONALE FOR THE AREA COVERED BY THE INSTRUCTIONAL UNIT.

STUDENT PERFORMANCE OBJECTIVES

THE STUDENT PERFORMANCE OBJECTIVES HAVE BEEN CONSIDERED THE BASIC ELEMENT OF THE UNITS OF INSTRUCTION. ALL OTHER ELEMENTS ARE DEVELOPED FROM THE PERFORMANCE OBJECTIVES. THE OBJECTIVES ARE STATED IN STUDENT TERMS AT A TERMINAL PERFORMANCE LEVEL. THE TERMINAL PERFORMANCES HAVE BEEN DEFINED FROM AN ANALYSIS OF COMPETENCIES NECESSARY FOR SUCCESSFUL PERFORMANCE IN THE ENTRY LEVEL SKILLED OCCUPATIONS OF AGRICULTURAL RESOURCES.

THE PERFORMANCE OBJECTIVES OF THE GUIDE ARE INTENDED TO AID CURRICULUM SPECIALISTS AND TEACHERS OF LOCAL AGRICULTURAL RESOURCES PROGRAMS IN DEFINING THE COMPETENCIES WHICH CAN AND SHOULD BE ACQUIRED BY STUDENTS IN LOCAL PROGRAMS.

IT WAS FELT THAT COMPETENT TEACHERS OF A VOCATIONAL PROGRAM WOULD BE IN THE BEST POSITION TO ESTABLISH "HOW WELL" THE OBJECTIVE SHOULD BE PERFORMED, AND THE CONDITIONS UNDER WHICH IT SHOULD BE PERFORMED. HOWEVER, CONDITIONS AND STANDARDS HAVE BEEN INDICATED FOR MOST OBJECTIVES. THE INTENT IS TO DIRECT ATTENTION TO THOSE CONDITIONS WHICH MAY SIGNIFICANTLY AFFECT ACHIEVING THE PERFORMANCE AND IDENTIFY STANDARDS WHICH MAY BE ESPECIALLY IMPORTANT TO SUCCESS IN THE INDUSTRY.

INSTRUCTIONAL AREAS

THE PERFORMANCE OBJECTIVES ARE DESCRIPTIONS OF INTENDED OUTCOMES WHICH REQUIRE THE ACQUISITION OF CERTAIN KNOWLEDGE AND SKILLS. TITLES AND SUBTITLES OF INSTRUCTIONAL AREAS ARE USED TO DEFINE THE RELEVANT CONTENT.

THE TITLES ARE PRESENTED IN AN ACTION FORM AS FAR AS IS FEASIBLE TO HELP DEFINE THE SPECIFIC TYPE OF LEARNING EXPECTED TO ACHIEVE THE OBJECTIVES. RATHER THAN LIMITING THE TITLE BY USING "WILDLIFE SANCTUARIES" IN DEFINING STUDY AREAS CONCERNING WILDLIFE SANCTUARIES, THE STUDY AREAS OF "SELECTING SPECIES OF WILDLIFE," AND "DEVELOPING FOOD, COVER AND WATER" ARE USED. THE GERUND VERB FORM OR "-ING" FORM OF THE TITLE IS TO AID IN MORE SPECIFICALLY DEFINING THE COMPETENCIES TO BE BROUGHT OUT IN THE LEARNING PROCESSES.

BECAUSE OF THE SPECIFIC NATURE OF MUCH OF THE LEARNING MATERIALS NEEDED FOR THESE INSTRUCTIONAL AREAS, REFERENCES ARE CITED WHICH WOULD BE APPROPRIATE FOR CURRICULUM DEVELOPERS. THE TITLES FOR THE INSTRUCTIONAL AREAS ARE OF A RELATIVELY PERMANENT NATURE AND COMMON TO MOST PROGRAMS. THE SPECIFIC CONTENT TO SUPPORT THEM IS MUCH MORE ADVERSELY AFFECTED BY CHANGES IN TECHNOLOGY, GEOGRAPHICAL DIFFERENCES OR DIFFERENCES IN LOCAL OCCUPATIONAL CHARACTERISTICS.

IT MAY BE POSSIBLE TO USE THE SUGGESTED TITLES OVER A PERIOD OF TIME WITH RELATIVELY MINOR ADJUSTMENTS. SPECIFIC CONTENT, ON THE OTHER HAND, NEEDS TO BE CONTINUALLY UPDATED TO CURRENT CONDITIONS AND MATCHED WITH LOCAL STUDENT NEEDS AND OCCUPATIONAL CHARACTERISTICS.

THE NUMBERS OF THE INSTRUCTIONAL AREA TITLES ARE NOT MATCHED TO THE NUMBERS OF THE STUDENT PERFORMANCE OBJECTIVES. HOWEVER, INSTRUCTIONAL AREAS RELATING TO AN OBJECTIVE CAN BE DETERMINED RELATIVELY EASILY. THE INSTRUCTIONAL AREAS ARE SEQUENCED AS MUCH AS IS FEASIBLE IN THE SAME ORDER AS THE PERFORMANCE OBJECTIVES TO WHICH THEY RELATE.

EXAMPLES OF STUDENT LEARNING ACTIVITIES

EXAMPLES ARE PROVIDED SUGGESTING WAYS IN WHICH STUDENTS MAY

BE ACTIVELY INVOLVED IN LEARNING ACTIVITIES THAT WOULD HELP THEM ACHIEVE THE OBJECTIVES. THEY ARE SUGGESTED AS ONE APPROACH THAT MAY BE USED RATHER THAN INTENDED TO BE THE COMPLETE LIST OF ACTIVITIES WHICH WOULD PROVIDE THE MOST EFFECTIVE LEARNING. THE SUGGESTED ACTIVITIES FOR EACH OBJECTIVE MAY OR MAY NOT COVER THE ENTIRE OBJECTIVE. THEREFORE, DEVELOPMENT OF OTHER ACTIVITIES FOR THE LOCAL PROGRAM WILL BE NECESSARY FOR A COMPREHENSIVE PROGRAM.

THERE IS AT LEAST ONE ACTIVITY FOR EACH STUDENT PERFORMANCE OBJECTIVE. THE NUMBER ON THE ACTIVITY IS THE SAME AS THE STUDENT PERFORMANCE OBJECTIVE TO WHICH IT IS RELATED.

EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

THE STUDENT EVALUATION SHOULD BE DIRECTED TOWARD AND BASED UPON WELL-WRITTEN STUDENT PERFORMANCE OBJECTIVES. IN THIS GUIDE, THE STUDENT PERFORMANCE OBJECTIVES ARE INTENDED TO BE EXPLICITLY STATED IN WHAT TERMINAL PERFORMANCE THE STUDENT IS TO BE ABLE TO DO AND, TO SOME DEGREE, HOW WELL AND UNDER WHAT CONDITIONS. PRIMARILY, THE EVALUATION IS TO USE THE STATED OBJECTIVES AS A REFERENCE POINT TO ANSWER THE QUESTION - CAN THE STUDENT ACHIEVE THE DESIRED PERFORMANCE LEVEL?

IN ADDITION, AN ELEMENT DESIGNATED AS "EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE" IS INCLUDED IN EACH UNIT OF INSTRUCTION. EXAMPLES OF EVALUATION PROCESSES ARE INTENDED TO ASSIST IN DETERMINING THE LEVEL OF UNDERSTANDING OF THE ABILITY OF THE STUDENT TO ACCOMPLISH PARTS OF OR THE ENTIRE PERFORMANCE OBJECTIVE. IN NO WAY ARE THESE PROCESSES INTENDED TO REPLACE A DIRECT EVALUATION OF THE TERMINAL PERFORMANCE AS STATED IN THE OBJECTIVE.

THE TYPE OF EVALUATION PROCESS IS DETERMINED IN PART BY THE NATURE OF THE PERFORMANCE OBJECTIVES. BUT THE MOST DESIRABLE METHOD CAN BE BEST DETERMINED WHEN THERE IS KNOWLEDGE OF THE LOCAL SITUATION, SUCH AS EDUCATIONAL RESOURCES, SCHOOL POLICIES AND THE NEEDS OF THE STUDENTS.

THERE IS AT LEAST ONE EVALUATION PROCESS FOR EACH STUDENT PERFORMANCE OBJECTIVE. THE NUMBER ON THE EVALUATION ACTIVITY IS THE SAME AS THE STUDENT PERFORMANCE OBJECTIVE TO WHICH IT IS RELATED.

INSTRUCTIONAL MATERIALS OR EQUIPMENT

MATERIALS OR EQUIPMENT ARE NOTED WHICH ARE SPECIFIC TO THE UNIT AND WHICH ARE CONSIDERED ESSENTIAL OR QUITE DESIRABLE IN THE LEARNING PROCESS. IN SOME CASES, THE OBJECTIVES WOULD BE QUITE DIFFICULT TO ACHIEVE, IF AT ALL, WITHOUT THE MATERIALS. IN OTHERS, THE MATERIALS OR EQUIPMENT AID IN THE EFFECTIVENESS OR

EFFICIENCY OF LEARNING.

THE MATERIALS AND EQUIPMENT SUGGESTED FOR ONE UNIT ARE NOT NECESSARILY CONSUMED OR UNIQUE JUST TO THE LEARNING ACTIVITIES OF THAT UNIT. A LIST OF THE EQUIPMENT SUGGESTED FOR A COMPREHENSIVE AGRICULTURAL RESOURCES PROGRAM IS LISTED IN APPENDIX A.

EXAMPLES OF SUPPORTING REFERENCES

A LIMITED NUMBER OF REFERENCES HAS BEEN LISTED WHICH DIRECTLY RELATE TO THE CURRICULUM STUDY AREAS SUGGESTED IN THE "INSTRUCTIONAL AREAS" SECTION. THESE REFERENCES ARE AVAILABLE AND THE SOURCES OR DETAILS OF SECURING THEM IS LOCATED IN APPENDIX B OF THIS GUIDE.

WHEN TWO OR MORE REFERENCES ARE FOUND TO HAVE ADEQUATE LEARNING MATERIALS AND PROCESSES FOR THE OBJECTIVES OF A UNIT BUT HAVE UNIQUELY DIFFERENT STYLES, THE GROUP MAY BE LISTED SO THAT THE TEACHER HAS THE CHOICE OF SELECTING THE ONE MOST SUITED TO HIS TEACHING.

IN SOME CASES, SEVERAL REFERENCES ARE NOTED BECAUSE NO ONE REFERENCE ADEQUATELY COVERS ALL OF THE OBJECTIVES OF A UNIT OR STUDY AREA. ANNOTATIONS OF THE REFERENCES ARE PROVIDED TO AID IN DETERMINING WHICH REFERENCE OR REFERENCES WOULD BE BEST SUITED FOR A LOCAL PROGRAM. THE REFERENCE SUGGESTED FOR ONE UNIT IS OFTEN RELEVANT TO AND SUGGESTED FOR USE IN SEVERAL OF THE UNITS. IN NO WAY SHOULD THE REFERENCES BE CONSIDERED THE BEST OR ONLY REFERENCES TO BE USED WITH THE UNITS.

Recommended Facilities and Equipment

SUGGESTIONS FOR PLANNING THE FACILITIES FOR AGRICULTURAL RESOURCES PROGRAMS

THE NATURE AND THE EXTENT OF THE FACILITIES NEEDED FOR AGRICULTURAL RESOURCES INSTRUCTION WILL BE INFLUENCED BY THE PROJECTED ENROLLMENTS, THE PLANNED USE OF THE FACILITIES BY CONTINUING EDUCATION AND OTHER GROUPS, AND THE AREAS OF EMPHASIS IN THE COURSE OF STUDY. THE SUGGESTIONS WHICH FOLLOW ARE TO BE CONSIDERED ONLY AS GUIDES FOR SCHOOL FACILITY PLANNERS AND ARCHITECTS.

SPACE ALLOCATIONS

RECOMMENDED MINIMUM SPACE ALLOCATIONS FOR ACCOMMODATING TWENTY STUDENTS PER SECTION INCLUDE:

CLASSROOM --- 720 SQUARE FEET
INDOOR LABORATORY --- 3,000 SQUARE FEET
OFFICE AND CONFERENCE ROOM --- 200 SQUARE FEET
OUTSIDE PAVED AND FENCED STORAGE
AREA --- 1,200 SQUARE FEET
LAND LABORATORY --- 35 ACRES

CLASSROOM

THE CLASSROOM SHOULD BE EQUIPPED WITH TABLES AND CHAIRS TO ACCOMMODATE THE ANTICIPATED NUMBER OF STUDENTS; A TACK BOARD; A CHALKBOARD; A TEACHER'S WORK BENCH WITH SINK, RUNNING WATER, GAS, AIR AND ELECTRICAL OUTLETS; SHELF SPACE; STORAGE SPACE; AND FILING CABINETS.

CONSIDERATION SHOULD BE GIVEN TO PROVIDING SOME COMBINATION STUDENT TABLES WITH EITHER FULL OR PARTIAL TILTING TOP WHICH WOULD PROVE USEFUL IN PHASES OF THE INSTRUCTIONAL PROGRAM REQUIRING DRAWING OR MAP WORK.

CONSERVATION MECHANICS LABORATORY

SUITABLE FACILITIES SHOULD BE PROVIDED SO THAT STUDENTS WILL HAVE AN APPROPRIATE PLACE TO WORK ON SMALL GASOLINE ENGINES AND LARGER POWER UNITS, FOR CONSTRUCTION OF LAND LABORATORY STRUCTURES AND FACILITIES, TO MAINTAIN HAND AND POWER EQUIPMENT, AND TO PROVIDE OPPORTUNITIES FOR THE STUDENTS TO OBTAIN THE MECHANICS SKILLS NECESSARY FOR EMPLOYMENT. THE LABORATORY AREA SHOULD HAVE A CONCRETE FLOOR, AN OVERHEAD DOOR AT LEAST 16 FEET WIDE, AND ADEQUATE HEATING, VENTILATION AND LIGHTING. IT SHOULD ALSO BE PROVIDED WITH APPROPRIATE BENCHES, TOOL CABINETS AND ACCESSORIES. ACCESS TO THE LAND LABORATORY AREA SHOULD BE CONVENIENT.

THE LAND LABORATORY

THE LAND LABORATORY SHOULD CONSIST OF A MINIMUM OF THIRTY-FIVE ACRES. THE LAND LABORATORY AREA SHOULD INCLUDE AN ARBORETUM WITH DIFFERENT KINDS OF TREES, SHRUBS, GRASSES AND OTHER PLANTS FOR IDENTIFICATION PURPOSES. FROM THREE TO FIVE PLANTS OF EACH SPECIES OR CULTIVAR SHOULD BE PLANTED TO INSURE AGAINST LOSS OF SINGLE SPECIMENS AND TO ENABLE STUDENTS TO RECOGNIZE MORE THAN ONE SPECIMEN. A FOREST PLANTATION WITH A MINIMUM OF FIFTEEN ACRES SHOULD BE AVAILABLE FOR TREE IDENTIFICATION, CRUISING, DEMONSTRATIONS OF TYPES OF CUTTING, WEED TREE CONTROL, AND SILVICULTURAL PRACTICES. A WILDLIFE HABITAT AREA COULD BE PROVIDED IN CONJUNCTION WITH THE FOREST PLANTATION. RECREATION FACILITIES FOR ONE OR MORE RECREATIONAL VEHICLES, A TENTING AREA AND A PICNIC AREA SHOULD BE DEVELOPED NEAR THE SCHOOL FOREST. THE ROAD LEADING TO THE RECREATION AREA NEEDS TO BE SUBSTANTIAL AND WIDE ENOUGH TO CARRY RECREATION VEHICLES AND BUSES. A POND

OF NOT LESS THAN ONE-QUARTER OF AN ACRE IN SURFACE AREA SHOULD BE AVAILABLE TO PROVIDE AN OPPORTUNITY FOR "HANDS-ON" EXPERIENCE IN SEVERAL INSTRUCTIONAL AREAS, INCLUDING FISH AND RECREATION.

RECOMMENDED EQUIPMENT AND SUPPLIES

THE TYPE AND QUANTITIES OF EQUIPMENT AND SUPPLIES REQUIRED TO PROVIDE EFFECTIVE OCCUPATIONAL EDUCATION IN AGRICULTURAL RESOURCES WILL DEPEND UPON SEVERAL FACTORS. THESE INCLUDE: THE ANTICIPATED SIZES OF THE GROUPS TO BE SERVED; THE TYPES OF GROUPS TO BE SERVED, THAT IS, SECONDARY OR ADULT; AND THE EMPHASIS TO BE INCLUDED IN THE COURSE OF STUDY IN TERMS OF THE DIVERSIFICATION OR SPECIALIZATION.

THE OPTIMUM CLASS SIZE IS CONSIDERED, FOR PLANNING PURPOSES, TO BE ABOUT TWENTY STUDENTS. SUFFICIENT QUANTITIES OF TOOLS, EQUIPMENT AND SUPPLIES SHOULD BE PROVIDED TO MAKE MAXIMUM USE OF THE TIME AVAILABLE FOR LABORATORY AND PRACTICAL EXERCISES. THIS WILL NOT REQUIRE NECESSARILY THAT TWENTY DUPLICATES OF A SPECIFIC ITEM WILL BE NEEDED AS PROPER MANAGEMENT OF PRACTICAL SITUATIONS WILL SELDOM RESULT IN EACH PUPIL USING THE IDENTICAL ITEM AT THE SAME TIME.

AN ADVISORY COMMITTEE COMPOSED OF REPRESENTATIVES FROM EACH OF THE OCCUPATIONAL AREAS IN THE LOCAL AGRICULTURAL RESOURCES INDUSTRY CAN PROVIDE VALUABLE ASSISTANCE IN DEVELOPING LISTS OF NEEDED EQUIPMENT AND SUPPLIES.

A LIST OF EQUIPMENT THAT CAN BE USED AS A GUIDE IN ORDERING AND ASSEMBLING THOSE ITEMS NEEDED IS LOCATED IN APPENDIX A. MANY STATE DEPARTMENTS HAVE MORE DEFINITIVE LISTS AVAILABLE AND IT MAY BE WELL TO REQUEST THESE AS ADDITIONAL SOURCES OF INFORMATION. IN ADDITION, EXPERIENCE CAN BE AN IMPORTANT FACTOR IN DEVELOPING LISTS OF EQUIPMENT NEEDS.

Teacher Requirements and Responsibilities

THE EFFECTIVENESS OF AN AGRICULTURAL RESOURCES OCCUPATIONAL CURRICULUM DEPENDS LARGELY UPON THE EXPERIENCE, EDUCATIONAL BACKGROUND AND PERSONAL QUALITIES OF THE FACULTY. INSTRUCTORS IN AGRICULTURAL RESOURCES REQUIRE ADVANCED PROFESSIONAL PREPARATION IN THE AREAS THEY ARE TO TEACH. WITH FEW EXCEPTIONS, THEY SHOULD HOLD AT LEAST A BACHELOR'S DEGREE WITH MAJOR EMPHASIS IN AGRICULTURAL RESOURCES AND VOCATIONAL EDUCATION. THEY SHOULD HAVE HAD WORK EXPERIENCE IN A GOVERNMENT AGENCY OR IN AN INDUSTRY DIRECTLY RELATED TO AGRICULTURAL RESOURCES. EXPERIENCE AND WILLINGNESS TO WORK WITH YOUTH ORGANIZATIONS IS ALSO AN ESSENTIAL ELEMENT OF THE TEACHER'S OCCUPATIONAL PREPARATION. FACULTY MEMBERS WITH BOTH A THEORETICAL AND PRACTICAL BACKGROUND CAN BRING TO THE PROGRAM THE ENTHUSIASM AND APPRECIATION FOR RESOURCES THAT ARE ESSENTIAL TO THE PROGRAM'S SUCCESS.

THE INSTITUTION MUST INSURE THAT ITS FACULTY WORKLOAD PERMITS TIME FOR INDIVIDUAL AND DEPARTMENTAL ACTIVITIES AS WELL AS THE SUPERVISION OF STUDENTS ON THE JOB. FACULTY MEMBERS SHOULD HAVE APPROPRIATE TRAINING AIDS AND SUPPLEMENTAL MATERIAL FOR THEIR RESPECTIVE COURSES AND A WORKING KNOWLEDGE OF WHAT OTHERS ARE TEACHING IN AGRICULTURAL RESOURCES, AGRICULTURE AND RELATED COURSE CONTENT.

FACULTY MEMBERS SHOULD BE ENCOURAGED TO PARTICIPATE IN ACTIVITIES AND ORGANIZATIONS WHICH LEAD TO PERSONAL PROFESSIONAL DEVELOPMENT THROUGH OFFERING RELEASED TIME AND FINANCIAL ASSISTANCE FOR IN-SERVICE TRAINING. THE IN-SERVICE TRAINING PROGRAM SHOULD BE DEVELOPED TO STRENGTHEN INDIVIDUAL WEAKNESSES. ONE TEACHER MAY PROFIT MORE FROM SUMMER EMPLOYMENT IN INDUSTRY, WHILE ANOTHER SHOULD ATTEND FORMAL CLASSES. MAINTAINING CLOSE CONTACT WITH PRACTITIONERS AND CURRENT LITERATURE IN THE FIELD THROUGH SPECIAL INSTITUTES AND CONFERENCES SHOULD PROVIDE A BASIS FOR CONSTANT UPDATING OF MATERIAL FOR THEIR COURSES.

ADVISORY COMMITTEES

ADVISORY COMMITTEES UTILIZING COMMUNITY RESOURCE PERSONS CAN ASSIST THE SECONDARY INSTITUTION ADMINISTRATION IN PLANNING AND IMPLEMENTING AGRICULTURAL RESOURCES PROGRAMS TO MEET THE OBJECTIVES OF THE INSTITUTION, THE STUDENT AND THE COMMUNITY.

THE SPECIAL ADVISORY COMMITTEE FOR THE NATURAL RESOURCE OCCUPATIONAL PROGRAMS SHOULD INCLUDE REPRESENTATIVES OF EMPLOYERS AND PUBLIC EMPLOYMENT SERVICES, SCIENTIFIC OR TECHNICAL SOCIETIES AND ASSOCIATIONS IN THE FIELD AND KNOWLEDGEABLE CIVIC LEADERS WHO MEET WITH AND ADVISE THE SPECIALISTS ON THE SCHOOL STAFF. THE COMMITTEE NORMALLY CONSISTS OF ABOUT NINE TO TWELVE MEMBERS WHO GENERALLY SERVE FOR A ONE- TO THREE-YEAR PERIOD. THE HEAD OF THE INSTITUTION OR THE DEPARTMENT HEAD IS ORDINARILY CHAIRMAN. MEMBERS ARE APPOINTED FOR REGULAR TERMS, SUBJECT TO REAPPOINTMENT, AND MEMBERSHIP SHOULD ROTATE SO THAT SOME EXPERIENCED ADVISORS ARE PRESENT WITH SOME NEW ONES EACH TERM. IT SHOULD BE REMEMBERED THAT ADVISORY COMMITTEE PEOPLE ARE BUSY; THEREFORE, MEETINGS SHOULD BE CALLED ONLY WHEN COMMITTEE ACTION CAN BEST HANDLE A SPECIFIC TASK OR PROBLEM.

LETTERS OF APPOINTMENT SHOULD COME FROM THE CHIEF SCHOOL ADMINISTRATOR. WHILE THE COMMITTEE FUNCTIONS WITHOUT LEGAL STATUS OR POWERS, IT CAN PROVIDE INVALUABLE ASSISTANCE TO THE INSTITUTION BY ASSISTING IN A FEASIBILITY STUDY OF PROPOSED NEW EDUCATIONAL PROGRAMS, BY PROVIDING SUPPORT TO SCHOOL ADMINISTRATORS IN OBTAINING APPROPRIATIONS AND STATE AND FEDERAL SUPPORT TO FINANCE THE PROGRAMS, BY ASSISTING IN THE LOCATION OF WORK EXPERIENCE STATIONS, BY SURVEYING AND DEFINING THE KNOWLEDGE AND SKILLS NEEDED BY AGRICULTURAL RESOURCES WORKERS, AND BY ASSISTING IN THE PLACEMENT OF GRADUATES (IN JOBS).

THIS GUIDE, DESIGNED PRIMARILY FOR PLANNING AND DEVELOPMENT OF PROGRAMS IN HIGH SCHOOLS, CAN BE USED BY THE ADVISORY COMMITTEE AS A STARTING POINT, MODIFYING IT TO MEET LOCAL NEEDS. THE PROGRAM CAN ALSO FORM THE BASIS FOR COURSES TO MEET THE REQUIREMENTS OF EMPLOYED ADULTS WHO WISH TO UPGRADE OR UPDATE THEIR SKILLS AND TECHNICAL CAPABILITIES. IN THIS WAY, THE SCHOOL ADMINISTRATION, WITH THE HELP OF THE COMMITTEE AND SPECIAL CONSULTANTS, CAN EFFECTIVELY INITIATE THE NEEDED PROGRAM, QUICKLY DEVELOP IT TO A HIGH LEVEL OF EXCELLENCE, AND MAINTAIN ITS TIMELINESS.

Scientific and Technical Societies and Trade Associations

SCIENTIFIC AND TECHNICAL SOCIETIES, COMMERCIAL FIRMS AND TRADE GROUPS ARE AN IMPORTANT SOURCE OF INSTRUCTIONAL MATERIALS AND OTHER BENEFITS FOR TEACHERS AND STUDENTS. THE SOCIETIES, IN THEIR PUBLICATIONS AND AT MEETINGS, PROVIDE CONTINUAL EXPOSURE TO THE MOST RECENT DEVELOPMENTS IN THE SCIENCE AND RELATED TECHNOLOGIES AND PROBABLY SERVE AS THE BEST MEANS FOR HELPING PERSONS KEEP UP-TO-DATE IN A PARTICULAR PHASE OF THE SCIENCE.

LESS CONSPICUOUS, BUT EXTREMELY IMPORTANT, IS THE SUPPORT WHICH SOCIETIES MAY GIVE: (1) IN HELPING TO DEVELOP EVIDENCE OF THE NEED FOR THE TRAINING PROGRAM; (2) IN HELPING TO PROMOTE THE PROGRAM; (3) IN ENLISTING MEMBERS' SUPPORT FOR THE PROGRAM; (4) IN HELPING TO PROVIDE WORK EXPERIENCE FOR STUDENTS; AND (5) IN HELPING WITH THE PLACEMENT OF GRADUATES.

ASSOCIATIONS AND SOCIETIES MAY SUPPLY RESOURCE PEOPLE TO SPEAK TO CLASSES. THEY MAY ALSO SERVE AS HOSTS TO STUDENT GROUPS ON FIELD TRIPS TO STUDY SPECIFIC PHASES OF THE INDUSTRY.

THE FOLLOWING IS A SELECTED LISTING OF SOME OF THE ORGANIZATIONS AND ASSOCIATIONS WHICH ARE PERTINENT TO AGRICULTURAL RESOURCES:*

AMERICAN CONGRESS ON SURVEYING AND MAPPING
AMERICAN FISHERIES SOCIETY
AMERICAN FOREST INSTITUTE
AMERICAN FOREST PRODUCTS INDUSTRIES
THE AMERICAN FORESTRY ASSOCIATION
AMERICAN GEOLOGICAL INSTITUTE
AMERICAN GEOPHYSICAL UNION
AMERICAN INSTITUTE OF PLANNERS
AMERICAN METEOROLOGICAL SOCIETY
AMERICAN PETROLEUM INSTITUTE

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* SEE APPENDIX C FOR A COMPLETE ADDRESS OF THESE ORGANIZATIONS AND ASSOCIATIONS

AMERICAN PLYWOOD ASSOCIATION
AMERICAN PULPWOOD ASSOCIATION
AMERICAN SOCIETY OF PHOTOGRAMMETRY
AMERICAN WATER RESOURCES ASSOCIATION
ASSOCIATION OF INTERPRETIVE NATURALISTS
CONSERVATION EDUCATION ASSOCIATION
ECOLOGICAL SOCIETY OF AMERICA
ENTOMOLOGICAL SOCIETY OF AMERICA
INSTITUTE OF ENVIRONMENTAL SCIENCES
NATIONAL AUDUBON SOCIETY
NATIONAL COAL ASSOCIATION
NATIONAL PARKS AND CONSERVATION ASSOCIATION
NATIONAL RECREATION AND PARK ASSOCIATION
NATIONAL RIFLE ASSOCIATION
NATIONAL SHOOTING SPORTS FOUNDATION
NATIONAL WILDLIFE FEDERATION
THE SOCIETY OF AMERICAN FORESTERS
SOCIETY FOR RANGE MANAGEMENT
SOIL CONSERVATION SOCIETY OF AMERICA, INC.
SOIL SCIENCE SOCIETY OF AMERICA
WATER POLLUTION CONTROL FEDERATION
WESTERN WOOD PRODUCTS ASSOCIATION
THE WILDERNESS SOCIETY
WILDLIFE MANAGEMENT INSTITUTE
THE WILDLIFE SOCIETY

Employment Opportunities in Agricultural Resources

AGRICULTURAL RESOURCES ARE ALL OF THOSE NATURALLY OCCURRING MATERIALS OF NATURE HAVING HUMAN UTILITY OR VALUE. THE TERM AGRICULTURAL RESOURCES INCLUDES, IN ALL THEIR FORMS, SOIL, WATER, AIR, PLANT LIFE, NON-HUMAN ANIMAL LIFE, SUNLIGHT, MINERALS AND MINERAL FUELS AND SPACE ON LAND AND OCEAN SURFACES.

RESOURCES ARE CLASSIFIED AS BEING RENEWABLE OR NONRENEWABLE. RENEWABLE RESOURCES, SUCH AS WATER, FORESTS AND WILDLIFE, ARE GENERALLY CONSIDERED TO HAVE THE POTENTIAL OF BEING MAINTAINED OR IMPROVED IN QUANTITY OR QUALITY OR BOTH. NONRENEWABLE RESOURCES ARE THOSE WHICH CANNOT BE REPLACED OR ACCUMULATED AGAIN AT ANY FORSEEABLE TIME IN THE FUTURE. EXAMPLES OF NONRENEWABLE RESOURCES ARE MINED MINERAL MATERIALS, WHICH MAKE UP PORTIONS OF THE EARTH'S CRUST, AND SPACE ON LAND.

DEMANDS UPON AGRICULTURAL RESOURCES ARE GROWING AT A TREMENDOUS RATE. AREAS IN WHICH THE TREND IN DEMAND IS HIGHEST INCLUDE FORESTRY, WATER AND OUTDOOR RECREATION. THESE TRENDS MEAN INCREASED CAREER OPPORTUNITIES FOR PREPARED INDIVIDUALS. WITH THE PRESENT COMMITMENT TO ENVIRONMENTAL IMPROVEMENT, THERE IS LIKELY TO BE A RAPID CHANGE IN PREVIOUS EMPLOYMENT TRENDS IN AGRICULTURAL RESOURCES OCCUPATIONS. THE EFFECTIVE DEMAND FOR SKILLED WORKERS AND TECHNICIANS TO ASSIST THE PROFESSIONAL

WORKER CAN BE EXPECTED TO RISE PARTICULARLY RAPIDLY.

AS AGRICULTURAL RESOURCES OCCUPATIONS BECOME MORE PLENTIFUL, PERSONS QUALIFIED AND WILLING TO PREPARE FOR CAREERS IN THIS FIELD WILL FIND NUMEROUS OPPORTUNITIES. A PARTIAL LIST OF TYPICAL ENTRY LEVEL OCCUPATIONS PRESENTLY FOUND IN THE AGRICULTURAL RESOURCES AREA FOR PERSONS COMPLETING THE COURSE OUTLINED IN THIS GUIDE MIGHT INCLUDE:

Major Occupational Group:	Entry Level Skilled Occupation:	D.O.T. No.:
FISH	FISH HATCHERY WORKER	436.884
FORESTRY	TREE PLANTER	441.887
	TREE PRUNER	441.887
	TREE SPRAYER	441.887
	FORESTER AIDE	441.384
	FOREST CRUISER	449.287
	FIRE WARDEN	441.168
	FIRE LOOKOUT	441.168
	FOREST FIRE FIGHTER	441.887
	FIRE PATROLMAN	441.687
MINING AREA RESTORATION	MINE AREA RESTORATION WORKER	040.081
	OPEN PIT MINE CONSERVATION INSPECTOR	168.287
OUTDOOR RECREATION	GROUNDSKEEPER	407.884
	PARK CARETAKER	407.868
	PARK WORKER	407.887
	CAMP GROUNDS CARETAKER	407.887
	GOLF COURSE GREENS KEEPER	407.137
	FISH AND GAME CLUB MANAGER	187.168
	RECREATION FACILITY ATTENDANT	329.878
	HUNTING AND FISHING GUIDE	452.868
	RECREATION FARM MANAGER	195.228
	GUN CLUB MANAGER	187.168
	BUILDING AND GROUNDS FOREMAN	891.138
SOIL	SURVEYOR'S ASSISTANT (RODMAN)	018.587
	SURVEYOR'S ASSISTANT (CHAINMAN)	018.687
	SOIL CONSERVATION AIDE	040.081

Major Occupational Group:	Entry Level Skilled Occupation:	D.O.T. No.:
RANGE	RANGE AIDE	040.081
WATER	WATERSHED TENDER	954.782
	IRRIGATOR	422.887
WILDLIFE	GAME FARM WORKER	419.884
	GAMEKEEPER	451.181
	GAME PROTECTOR (WARDEN)	379.168
	GAME FARMER	419.181
	GOVERNMENT TRAPPER OR HUNTER	379.168
	LIVE BAIT DEALER	162.158

Validation of Agricultural Resources Units

THE AGRICULTURAL RESOURCES UNITS HAVE BEEN DEVELOPED THROUGH THE USE OF MANY VARYING CURRICULUM GUIDES AND INSTRUCTIONAL MATERIALS ACCUMULATED FROM SOURCES THROUGHOUT THE UNITED STATES. THESE CURRICULUM GUIDES AND INSTRUCTIONAL MATERIALS RANGED FROM TOPIC OUTLINES TO COMPREHENSIVE REFERENCE MATERIALS. THE UNITS CONTAINED IN THIS GUIDE WILL HOPEFULLY PROVIDE A COMPREHENSIVE BASE FOR PROGRAM PLANNING AND DEVELOPMENT BY STATE CURRICULUM PLANNERS, STATE SUPERVISORS AND TEACHERS IN DEVELOPING LOCAL PROGRAMS. A MAJOR REFERENCE USED IN DEVELOPING THE UNITS, CAREER EDUCATION IN THE NATURAL RESOURCES: A SUGGESTED HIGH SCHOOL CURRICULUM GUIDE, WAS DEVELOPED AT THE PENNSYLVANIA STATE UNIVERSITY PURSUANT TO A GRANT FROM THE UNITED STATES OFFICE OF EDUCATION IN 1971.

OTHER SOURCES INCLUDED STUDENT MANUALS DEVELOPED AND VALIDATED BY THE OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, SUCH AS THE CONSERVATION AIDE, AND MANUALS DEVELOPED AT THE PENNSYLVANIA STATE UNIVERSITY, SUCH AS MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE: TEACHER'S GUIDE AND STUDENT RESOURCE UNIT.

OTHER GUIDES AND INSTRUCTIONAL MATERIALS OF GREAT VALUE IN DETERMINING COMPETENCIES AND CONTENT WHICH SHOULD BE INCLUDED IN THE UNITS WERE THOSE FROM NEW YORK, NORTH CAROLINA, ARIZONA, OHIO AND TEXAS.

THE TERMINAL OBJECTIVES CITED AT THE BEGINNING OF THE UNITS ARE BASED UPON OCCUPATIONAL ANALYSES CONDUCTED BY THE PROJECT STAFF AND/OR OTHER OCCUPATIONAL ANALYSES CONDUCTED IN THE VARIOUS OCCUPATIONAL CLUSTER AREAS OF AGRICULTURAL RESOURCES BY

VARIOUS INDIVIDUALS THROUGHOUT THE UNITED STATES.

THE UNITS INCLUDED IN THIS GUIDE HAVE BEEN REVIEWED BY A NUMBER OF AGRICULTURAL RESOURCES INSTRUCTORS IN OHIO. THESE TEACHERS REPRESENT A BROAD BASE OF EXPERIENCE IN THE VARIOUS AGRICULTURAL RESOURCES AREAS.

ANOTHER PHASE OF THE VALIDATION PROCESS INCLUDED THE REVIEW OF THE GUIDE BY STATE AND NATIONAL CURRICULUM SPECIALISTS. THESE INDIVIDUALS ARE INVOLVED WITH DEVELOPING CURRICULUM MATERIALS FULL TIME AND PROVIDED VALUABLE INPUT FOR THE REVISION AND IMPROVEMENT OF THIS GUIDE.

IT MUST ALSO BE NOTED THAT, ALTHOUGH THIS SECTION HAS CITED SOURCES OF REFERENCES USED IN DEVELOPING THE GUIDE, THIS IS BY NO MEANS AN EXHAUSTIVE LIST OF THOSE MATERIALS ACQUIRED AND USED AS INFORMATION SOURCES. THE STATE OF THE ART IN CURRICULUM MATERIALS IN AGRICULTURAL RESOURCES, AS FOUND BY THIS PROJECT, IS VERY PROMISING. MANY STATE DEPARTMENTS AND CURRICULUM LABORATORIES HAVE DEVELOPED EXCELLENT INSTRUCTIONAL AIDS, INCLUDING STUDENT MANUALS, FILM STRIP AND SLIDE SERIES, TRANSPARENCY SETS AND CURRICULUM GUIDES WHICH CAN BE USED AS SUPPLEMENTARY REFERENCE MATERIALS FOR THE UNITS IN THIS GUIDE.

THIS CURRICULUM GUIDE IN AGRICULTURAL RESOURCES PROVIDES A PLAN FOR DEVELOPING PROGRAMS BASED ON MANY OF THESE VARYING INSTRUCTIONAL MATERIALS AND CITES REFERENCES FROM SEVERAL OF THESE SOURCES OF CURRICULUM MATERIALS. OTHER VALUABLE AIDS ARE AVAILABLE FROM THESE SOURCES WHICH WILL COMPLEMENT THE INSTRUCTIONAL PROGRAM OUTLINED IN THIS CURRICULUM GUIDE.

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AGRICULTURAL RESOURCES
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UNITS GENERAL TO THE AGRICULTURAL RESOURCES AREAS

OCCUPATIONAL OPPORTUNITIES IN AGRICULTURAL RESOURCES

EMPLOYABILITY SKILLS AND HUMAN RELATIONS

DEVELOPING LEADERSHIP THROUGH FFA

OUTDOOR FIRST AID

OPERATION AND CARE OF SMALL GASOLINE ENGINES

MAINTENANCE OF SMALL GASOLINE ENGINES

OPERATION AND MAINTENANCE OF GASOLINE AND DIESEL POWER UNITS

OCCUPATIONAL OPPORTUNITIES IN AGRICULTURAL RESOURCES

UNIT CONCEPT: THE FIELD OF AGRICULTURAL RESOURCES INCLUDES A BROAD SPECTRUM OF CAREER OPPORTUNITIES THE STUDENT MAY WISH TO EXPLORE. BY STUDYING THE VARIOUS OCCUPATIONS, THE STUDENT IS ABLE TO CONSIDER VARIOUS FACTORS, SUCH AS WORKING CONDITIONS, SALARY AND REQUIREMENTS FOR ENTRY THAT WILL INFLUENCE HIS CAREER CHOICE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IN SEEKING INFORMATION ABOUT JOB OPPORTUNITIES, SURVEY OR OBTAIN LITERATURE INFORMATION WHICH WILL ASSIST HIM IN DETERMINING THE NUMBER AND KIND OF JOB OPPORTUNITIES THAT ARE AVAILABLE IN AGRICULTURAL RESOURCES.

2. GIVEN A SPECIFIC CAREER IN WHICH THE STUDENT IS INTERESTED, DETERMINE THE COMPETENCIES AND REQUIREMENTS NEEDED BY PERSONS TO ENTER AND ADVANCE IN THAT CAREER.

3. UPON DETERMINING THE REQUIREMENTS AND COMPETENCIES NEEDED TO ENTER A JOB, DEVELOP A PERSONAL PLAN WHICH WILL AID HIM IN ACQUIRING THE COMPETENCIES AND MEETING THE REQUIREMENTS NEEDED FOR ENTRY IN THAT JOB.

4. UPON IDENTIFYING A JOB IN WHICH HE IS INTERESTED, FOLLOW THE PROPER PROCEDURES NECESSARY TO BECOME PLACED ON THE JOB.

5. UPON SECURING PLACEMENT ON A JOB, WORK WITH OTHER EMPLOYEES, THE EMPLOYER AND/OR CUSTOMERS IN A MANNER THAT WILL ENABLE THE STUDENT TO SUCCEED ON THE JOB.

B. INSTRUCTIONAL AREAS

1. ASSESSING THE JOB OPPORTUNITIES AVAILABLE IN AGRICULTURAL RESOURCES

   A. LOCATING INFORMATION REGARDING THE SCOPE OF AGRICULTURAL RESOURCES OCCUPATIONS AND THE OPPORTUNITIES FOR EMPLOYMENT.

B. SURVEYING THE LOCAL REGION FOR ENTRY LEVEL JOBS REGARDING THE NUMBER OF OPENINGS PER YEAR AND FUTURE EMPLOYMENT NEEDS

2. MAKING A DETAILED STUDY OF SELECTED AGRICULTURAL RESOURCES OCCUPATIONS

   A. DETERMINING PERSONAL INTERESTS AND HOW THEY RELATE TO A SPECIFIC JOB OR CLUSTER OF OCCUPATIONS

   B. ASSESSING THE COMPETENCIES THAT ARE NEEDED FOR ENTRY

   C. DETERMINING THE EDUCATIONAL REQUIREMENTS NECESSARY FOR EMPLOYMENT

   D. ASSESSING THE PERSONAL TRAITS REQUIRED BY THE OCCUPATION

   E. DETERMINING THE WORKER BENEFITS IN A GIVEN OCCUPATION

   F. CONSIDERING FEDERAL REGULATIONS WHICH APPLY TO VARIOUS OCCUPATIONS

3. DEVELOPING A PERSONAL PLAN FOR GAINING EXPERIENCES NECESSARY FOR GAINFUL EMPLOYMENT IN A GIVEN OCCUPATIONAL AREA

   A. PLANNING ACTIVITIES THAT WILL ENABLE THE STUDENT TO BE EXPOSED TO EXPERIENCES WHICH WILL AID IN HIS EMPLOYMENT

   B. WORKING WITH COOPERATORS IN DEVELOPING THE OCCUPATIONAL EXPERIENCE PROGRAM

   C. RECORDING THE ACTIVITIES IN THE OCCUPATIONAL EXPERIENCE PROGRAM

   D. SUPERVISING AND EVALUATING THE STUDENT'S OCCUPATIONAL EXPERIENCE PROGRAM

4. SECURING A JOB BY FOLLOWING THE PROPER PROCEDURES INVOLVED IN JOB PLACEMENT

   A. LOCATING POTENTIAL JOBS THROUGH VARIOUS SOURCES

   B. ASSESSING THE JOB DESCRIPTION AND THE STUDENT'S INTERESTS

   C. APPLYING FOR A JOB

(1) WRITING A LETTER OF APPLICATION
(2) PREPARING A RESUME
(3) SECURING REFERENCES

D. CONDUCTING THE PERSONAL INTERVIEW

5. CONSIDERING FACTORS IMPORTANT TO JOB SUCCESS AND ADVANCEMENT

A. ESTABLISHING RAPPORT WITH FELLOW EMPLOYEES, THE PUBLIC AND THE EMPLOYER

B. PERSONAL GROOMING AND ITS IMPACT UPON THE PUBLIC, THE EMPLOYER AND FELLOW EMPLOYEES

C. FOLLOWING DIRECTIONS AND WORKING INDEPENDENTLY IN AN OCCUPATION

D. DEVELOPING DESIRABLE WORK HABITS

E. CONTINUING SELF IMPROVEMENT ON THE JOB

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. CONDUCT A PERSONAL SURVEY BY PERSONAL CONTACT OR QUESTIONNAIRE OF AGRICULTURAL RESOURCES BUSINESSES OR AGENCIES TO DETERMINE THE NUMBER OF PERSONNEL EMPLOYED IN VARIOUS JOBS IN AGRICULTURAL RESOURCES AND THE NUMBER OF OPENINGS EACH YEAR.

2. INTERVIEW SEVERAL PERSONS IN SPECIFIC OCCUPATIONS AND DETERMINE THE COMPETENCIES AND REQUIREMENTS NEEDED TO ENTER THE OCCUPATION.

3. A. WRITE A LETTER OF APPLICATION AND FILL OUT AN APPLICATION FORM. HAVE THE CLASS MEMBERS CRITIQUE THEM.

B. VISIT THE MANAGERS OF AREA AGRICULTURAL RESOURCE BUSINESSES OR AGENCIES AND DISCUSS WITH THEM THE FACTORS THEY CONSIDER IN HIRING AN EMPLOYEE.

4. USING SIMULATION TECHNIQUES, HAVE THE STUDENTS ROLE PLAY JOB INTERVIEWS. RECORD THE INTERVIEWS ON A TAPE RECORDER AND HAVE EACH STUDENT CRITIQUE HIS OWN PRESENTATION. TO GUIDE THE STUDENTS IN THE CRITIQUE, HAVE THE CLASS DEVELOP A LIST OF CRITERIA FOR JOB INTERVIEWS AND CHECK THEMSELVES AGAINST THESE CRITERIA.

5. USING A PANEL COMPOSED OF EMPLOYERS AND EMPLOYEES, HAVE THE CLASS DISCUSS WITH THEM THE DEVELOPMENT AND MAINTENANCE OF WORKING RELATIONSHIPS BETWEEN EMPLOYEES AND EMPLOYER.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING A LIST OF AGRICULTURAL RESOURCES JOB TITLES, HAVE STUDENTS MATCH THESE TO THE MOST APPROPRIATE AGRICULTURAL RESOURCES ARFA. THESE JOB TITLES COULD ALSO BE MATCHED TO LEVEL OF POSITION, SUCH AS SKILLED, SEMI-SKILLED, TECHNICAL AND PROFESSIONAL. THESE TASKS SHOULD BE ACCOMPLISHED WITH 90% ACCURACY TO ALLOW FOR VARIATION IN JOB TITLE NAMES.

2. THE STUDENT WILL COMPLETE A SURVEY OF A GIVEN OCCUPATION OR CLUSTER OF OCCUPATIONS WHICH ASSESSES THE COMPETENCIES NEEDED FOR EMPLOYMENT, THE EDUCATIONAL REQUIREMENTS FOR GAINING EMPLOYMENT AND THE PERSONAL CHARACTERISTICS NEEDED FOR SUCCESSFUL EMPLOYMENT TO THE SATISFACTION OF THE TEACHER.

3. HAVE EACH STUDENT COMPLETE A PERSONAL PLAN FOR OBTAINING EMPLOYMENT IN HIS DESIRED OCCUPATION WHICH SHOULD INCLUDE THE NECESSARY EDUCATIONAL AND WORK EXPERIENCES IN ADDITION TO ANY SPECIAL COMPETENCIES THAT NEED TO BE ACQUIRED.

4. HAVE EACH STUDENT DEVELOP A LIST OF POINTS TO REMEMBER OR A CHECK LIST FOR WRITING A LETTER OF APPLICATION FOR A PARTICULAR JOB. THIS LIST SHOULD INCLUDE SUCH ITEMS AS NEATNESS, PROPER INTRODUCTION OF APPLICANT, WHERE APPLICANT CAN BE CONTACTED, REQUEST FOR NECESSARY APPLICATION FORMS, COMPLETENESS, AND PERSONAL REFERENCES.

5. THE TEACHER SHOULD EVALUATE EACH STUDENT AS TO HIS ABILITY TO WORK WITH OTHERS IN THE CLASSROOM, WHILE INVOLVED IN ORGANIZATIONAL ACTIVITIES AND/OR IN A COOPERATIVE PLACEMENT SITUATION. THE STUDENT SHOULD COMPLETE A PERSONAL EVALUATION SHEET TO BE USED WHEN DISCUSSING HIS ABILITIES, ATTRIBUTES, AND WEAKNESSES WITH THE TEACHER.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF JOB APPLICATION FORMS, LETTERS OF APPLICATION, OCCUPATIONAL SURVEY FORMS, PERSONAL CHARACTERISTICS CHECK LISTS, AND COPIES OF STATE AND FEDERAL LABOR REGULATIONS

2. APPROPRIATE TABLES, DESKS, CHAIRS AND TAPE RECORDER OR VIDEO TAPE MACHINES NECESSARY FOR CONDUCTING SIMULATED JOB INTERVIEWS

3. WRITTEN NOTICES FROM NEWSPAPERS, JOURNALS AND OTHER PUBLICATIONS LISTING VARIOUS JOB OPENINGS

F. EXAMPLES OF SUPPORTING REFERENCES

1. BINKLEY, HAROLD AND HAMMONDS, CARSIE. EXPERIENCE PROGRAMS FOR LEARNING VOCATION IN AGRICULTURE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 604 PAGES.

   THIS PUBLICATION PRESENTS AN OVERVIEW OF THE EXPERIENCE PROGRAM AND THE OPPORTUNITIES IN AGRICULTURAL RESOURCES THAT STUDENTS WILL FIND RELATIVELY EASY TO UNDERSTAND.

2. OPPORTUNITIES IN AGRICULTURAL OCCUPATIONS AND THE EMPLOYEE WITHIN THE BUSINESS ORGANIZATION. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, PP. 3-43.

   A STUDENT MANUAL, THIS REFERENCE MAY BE HELPFUL WHEN COVERING SUCH TOPICS AS APPLYING FOR A JOB, ASSESSING ONE'S PERSONAL CHARACTERISTICS, AND LOCATING JOB OPPORTUNITIES.

3. RESOURCE UNIT ON CAREER OPPORTUNITIES FOR CORE CURRICULUM. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA. 1970, 10 PAGES.

   DEVELOPED IN AN OUTLINE FORMAT, THIS REFERENCE WILL BE HELPFUL TO THE INSTRUCTOR IN DEVELOPING QUESTIONS AND PROBLEMS FOR DISCUSSION. INCLUDED IS A LIST OF FILMSTRIPS AND STUDENT ACTIVITIES FOR EXPLORING AGRICULTURAL OCCUPATIONS.

EMPLOYABILITY SKILLS AND HUMAN RELATIONS

UNIT CONCEPT: JOB PROCUREMENT, JOB ADVANCEMENT, AND GENERAL CAREER SUCCESS ARE PROMOTED THROUGH THE DEVELOPMENT OF COMPETENT COMMUNICATION SKILLS AND GOOD HUMAN RELATIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WRITE A PERSONAL RESUME AND LETTER OF APPLICATION, COMPLETE EMPLOYMENT APPLICATIONS AND CONDUCT HIMSELF IN AN INTERVIEW IN SUCH A MANNER THAT HE WILL BE ABLE TO PROCURE A JOB.

2. EFFECTIVELY CARRY ON A TELEPHONE CONVERSATION, INCLUDING INITIATING CONVERSATIONS, ANSWERING THE TELEPHONE, FORMULATING RESPONSES AND TAKING TELEPHONE MESSAGES.

3. EFFECTIVELY HANDLE A SALES PROCEDURE USING THE SIX BASIC STEPS IN SELLING FOR SALE OF SUPPLIES AND SERVICES TO PERSONS UTILIZING NATURAL RESOURCES.

4. IN WORKING IN AN AGRICULTURAL RESOURCES BUSINESS, IMPROVE HIS RELATIONS WITH FELLOW EMPLOYEES, EMPLOYER, SUPERVISORS AND THE PUBLIC AS EVALUATED BY THE EMPLOYER USING CRITERIA SUCH AS APPEARANCE, PUNCTUALITY, DEPENDABILITY, INTEREST, JUDGMENT, PRODUCTION, INITIATIVE AND COOPERATION.

B. INSTRUCTIONAL AREAS

1. PROCURING THE JOB

   A. WRITING LETTERS OF APPLICATION

   B. PREPARING PERSONAL DATA SHEETS

   C. FILLING OUT EMPLOYMENT APPLICATIONS

   D. INTERVIEWING

   E. OBTAINING SOCIAL SECURITY NUMBER AND BIRTH CERTIFICATE

2. IMPROVING COMMUNICATIONS SKILLS

   A. COMMUNICATING VIA TELEPHONE

      (1) INITIATING A TELEPHONE CONVERSATION
      (2) ANSWERING THE TELEPHONE
      (3) LISTENING TO TELEPHONE CONVERSATION AND FORMULATING RESPONSES
      (4) TERMINATING A TELEPHONE CONVERSATION
      (5) TAKING AND DELIVERING TELEPHONE MESSAGES

   B. COMMUNICATING THOUGHTS AND FACTS CLEARLY BY WRITING

      (1) USING TECHNICAL TERMS
      (2) USING CORRECT SPELLING AND GRAMMAR

3. IMPROVING SALES SKILLS

   A. DEVELOPING THE APPROACH

   B. FINDING CUSTOMERS' NEEDS AND DESIRES

   C. HELPING CUSTOMERS EXAMINE THE GOODS OR SERVICES

   D. ANSWERING CUSTOMERS' QUESTIONS AND OBJECTIVES

   E. COMPLETING THE SALE

   F. SUGGESTING ADDITIONAL MERCHANDISE OR SERVICE

4. IMPROVING ON THE JOB

   A. KEEPING THE JOB

      (1) DEVELOPING EMPLOYER-EMPLOYEE RELATIONS
      (2) DEVELOPING SURPERVISOR-EMPLOYEE RELATIONS THROUGH GIVING AND RECEIVING CONSTRUCTIVE CRITICISM
      (3) DEVELOPING EMPLOYEE-EMPLOYEE RELATIONS
      (4) DEVELOPING CLIENT- OR CUSTOMER-EMPLOYEE RELATIONS

   B. GROWING ON THE JOB

      (1) DEVELOPING EFFECTIVE WORK HABITS
      (2) IMPROVING TECHNICAL SKILLS

         (A) PLANNING FOR ADVANCEMENT
         (B) DEVELOPING SOCIAL CONSCIOUSNESS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USE ROLE PLAYING AMONG THE STUDENTS TO PRACTICE JOB INTERVIEWS.

   B. WRITE LETTERS REQUESTING SOCIAL SECURITY CARD AND BIRTH CERTIFICATE.

2. HAVE THE STUDENT RECORD A SIMULATED TELEPHONE CONVERSATION OF HIMSELF AND COMPLETE A SELF-RATING VOICE SCALE.

3. HAVE STUDENTS PARTICPATE IN AN AGRICULTURAL SUPPLIES OR PRODUCT SALES CAMPAIGN.

4. HAVE STUDENTS SURVEY SEVERAL AGRICULTURAL RESOURCES INDUSTRIES AND INTERVIEW THE PERSONNEL DIRECTOR, MANAGER OR OWNER TO IDENTIFY FACTORS IMPORTANT TO HUMAN RELATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DEVELOP A PERSONAL RESUME, WRITE LETTERS FOR JOB APPLICATION, COMPLETE JOB APPLICATION FORMS AND DISPLAY THE QUALITIES NEEDED FOR A SUCCESSFUL JOB INTERVIEW.

2. HAVE EACH STUDENT CONDUCT A SIMULATED BUSINESS TRANSACTION USING THE TELEPHONE TO THE SATISFACTION OF THE TEACHER.

3. HAVE EACH STUDENT PRESENT SUPPLIES AND/OR SERVICES TO CUSTOMERS IN A SIMULATED SETTING TO THE SATISFACTION OF THE TEACHER.

4. HAVE EACH STUDENT USE AN APPROPRIATE RATING SCALE FOR SELF-EVALUATION OF HIS HUMAN RELATIONS ABILITIES WITH EMPLOYEES, CUSTOMERS, SUPERVISORS AND EMPLOYER(S).

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TAPE RECORDER AND/OR VIDEO TAPE

2. TELEPHONES

F. EXAMPLES OF SUPPORTING REFERENCES

1. HUMAN RELATIONS IN AGRI-BUSINESS. EAST LANSING, MICHIGAN: DEPARTMENT OF SECONDARY EDUCATION AND CURRICULUM, MICHIGAN STATE UNIVERSITY.

THIS PUBLICATION IS INTENDED TO BE USED AS A STUDENT MANUAL FOR INDIVIDUALIZED INSTRUCTION. INCLUDED IS A BRIEF TEXT ON VARIOUS TOPICS IN HUMAN RELATIONS FOLLOWED BY STUDENT ACTIVITIES OR EXERCISES TO EVALUATE THE STUDENT'S COMPREHENSION OF THE TOPIC DISCUSSED.

2. HUMAN RELATIONS IN BUSINESS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, 70 PAGES.

   THE STUDENT REFERENCE INCLUDES BRIEF YET COMPREHENSIVE DISCUSSIONS AND EXERCISES, INCLUDING CASES, WHICH THE STUDENT CAN READ AND COMPLETE TO OBTAIN A BETTER UNDERSTANDING OF THE HUMAN RELATIONS PROCESS.

3. RESOURCE UNIT ON HUMAN RELATIONS. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA. 1971, 90 PAGES.

   IN THIS REFERENCE FOR TEACHERS, THE COMPLETE AREA OF HUMAN RELATIONS IS COVERED IN OUTLINE FORM. NUMEROUS CASE PROBLEMS ARE PRESENTED FOR STUDENTS AND TEACHERS TO CONSIDER DURING DISCUSSION PERIODS. VARIOUS RATING FORMS FOR SELF-EVALUATION ARE INCLUDED WHICH THE STUDENTS MAY COMPLETE. SAMPLE TEST ITEMS ARE ALSO INCLUDED.

DEVELOPING LEADERSHIP THROUGH FFA

UNIT CONCEPT: ACTIVE PARTICIPATION IN THE FFA WILL PROVIDE THE STUDENT OPPORTUNITIES FOR DEVELOPING PRACTICAL TRAINING IN AGRICULTURE, LEADERSHIP, COOPERATION AND CITIZENSHIP.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING THE BASIC PRINCIPLES OF LEADERSHIP, IDENTIFY THE ROLE OF THE FFA ORGANIZATION IN AGRICULTURAL RESOURCES EDUCATION.

2. USING THE OFFICIAL FFA MANUAL, IDENTIFY THE HISTORY, AIMS AND PURPOSES AND ORGANIZATION OF THE FFA ON THE LOCAL, STATE AND NATIONAL LEVEL.

3. BY ACTIVELY PARTICIPATING IN THE ORGANIZATION'S BUSINESS MEETINGS, DEMONSTRATE THE PRINCIPLES OF PARLIAMENTARY PROCEDURE AS PRESENTED IN ROBERT'S RULES OF ORDER OR OTHER ACCEPTABLE REFERENCES.

4. THROUGH ACTIVE PARTICIPATION IN THE ORGANIZATION, SERVE EFFECTIVELY AS A COMMITTEE MEMBER AND/OR CHAIRMAN IN PLANNING AND CARRYING OUT THE CHAPTER PROGRAM OF ACTIVITIES.

5. IF ELECTED, SERVE EFFECTIVELY AS AN OFFICER IN THE ORGANIZATION BY FULFILLING THE DUTIES OF THE OFFICE TO WHICH ELECTED.

6. THROUGH CHAPTER AND CLASSROOM ACTIVITIES, DEVELOP EFFECTIVE PUBLIC SPEAKING SKILLS SO AS TO BE ABLE TO MAKE INTRODUCTIONS, PARTICIPATE IN CONVERSATIONS AND PREPARE AND DELIVER SPEECHES AND TALKS.

7. THROUGH ACTIVE PARTICIPATION IN THE FFA, DEVELOP A STRONG SELF CONCEPT AND A POSITIVE ATTITUDE TOWARD WORKING IN SOCIETY AS EVIDENCED BY HIS PUBLIC AND PRIVATE ACTIVITIES.

B. INSTRUCTIONAL AREAS

1. DEVELOPING LEADERSHIP

A. PURPOSES FOR ATTAINING LEADERSHIP SKILLS

B. TYPES OF LEADERSHIP

(1) FORMAL LEADERSHIP
(2) INFORMAL LEADERSHIP

C. QUALITIES OF LEADERSHIP

D. STYLES OF LEADERSHIP

E. FUNCTIONS OF DEMOCRATIC LEADERSHIP

F. OPPORTUNITIES FOR DEVELOPING LEADERSHIP ABILITIES

(1) HOME
(2) SCHOOL
(3) COMMUNITY
(4) FFA

2. DETERMINING THE PLACE OF FFA IN AGRICULTURAL RESOURCES EDUCATION

A. THE VALUES OF FFA MEMBERSHIP

B. THE CONTRIBUTION OF THE FFA TO THE SCHOOL AND COMMUNITY

3. DETERMINING THE BACKGROUND OF THE FFA

A. IMPORTANT HISTORICAL FACTS

B. AIMS AND PURPOSES

C. COLORS, EMBLEM, MOTTO AND CREED

4. GOVERNING AND FINANCING THE FFA

A. LOCAL

B. STATE

C. NATIONAL

5. ATTAINING FFA MEMBERSHIP AND DEGREES

A. TYPES OF MEMBERSHIP

B. LOCAL, STATE AND NATIONAL DEGREES

6. PLANNING AND CONDUCTING A CHAPTER MEETING

   A. IDENTIFYING OFFICER RESPONSIBILITIES

   B. IDENTIFYING MEMBER RESPONSIBILITIES

   C. CONDUCTING THE BUSINESS MEETING

7. PLANNING AND CONDUCTING THE CHAPTER PROGRAM OF ACTIVITIES

   A. IDENTIFYING AREAS TO BE INCLUDED

   B. DEVELOPING A PROGRAM OF ACTIVITIES

   C. CARRYING OUT THE PROGRAM OF ACTIVITIES

      (1) IDENTIFYING CHAIRMAN RESPONSIBILITIES
      (2) IDENTIFYING COMMITTEE MEMBER RESPONSIBILITIES

8. PERFORMING FFA OFFICER DUTIES AND RESPONSIBILITIES

   A. IDENTIFYING QUALIFICATIONS FOR LOCAL, STATE AND NATIONAL OFFICES

   B. IDENTIFYING SPECIFIC DUTIES OF EACH OFFICER

   C. DETERMINING GENERAL RESPONSIBILITIES OF AN OFFICER

      (1) CONDUCTING CHAPTER PROGRAMS
      (2) PARTICIPATING IN OFFICER MEETINGS
      (3) PARTICIPATING IN LEADERSHIP ACTIVITIES
      (4) CONDUCTING CHAPTER MEETINGS

9. DEVELOPING PROFICIENCY IN PARLIAMENTARY PROCEDURE

   A. PRESIDING OVER MEETINGS

   B. PRESENTING MOTIONS CORRECTLY

10. DEVELOPING PUBLIC SPEAKING SKILLS

   A. DEVELOPING CONVERSATION SKILLS

   B. MAKING INTRODUCTIONS

   C. PREPARING A SPEECH OR TALK

   D. DELIVERING A SPEECH OR TALK

11. DETERMINING RESPONSIBILITIES OF FFA MEMBERS

   A. DEVELOPING PERSONAL ATTRIBUTES

(1) PERSONAL APPEARANCE
(2) PROPER MANNERS
(3) BEHAVIOR IN PUBLIC

B. USING THE FFA CODE OF ETHICS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. ANALYZE THE QUALITIES OF RECOGNIZED GOOD LEADERS.

2. ATTEND STATE AND/OR NATIONAL FFA CONVENTIONS TO OBSERVE THE OPERATION OF THE ORGANIZATION.

3. A. PARTICIPATE IN CLASSROOM STUDY AND PRACTICE OF PARLIAMENTARY PROCEDURE TO DEVELOP PARLIAMENTARY PROCEDURE SKILLS.

B. PLAN AND POST AGENDA IN ADVANCE OF REGULAR CHAPTER MEETINGS TO PROMOTE ATTENDANCE AND PARTICIPATION BY ALL MEMBERS.

C. ATTEND AND PARTICIPATE IN FFA MEETINGS TO DEVELOP LEADERSHIP ABILITIES.

D. PREPARE FOR AND PARTICIPATE IN PARLIAMENTARY PROCEDURE DEMONSTRATIONS AND CONTESTS.

4. A. ACCEPT AN FFA COMMITTEE ASSIGNMENT SUITED TO INTEREST AND ABILITY TO DEVELOP SKILLS IN COMMITTEE WORK.

B. SERVE AS A COMMITTEE CHAIRMAN TO DEVELOP LEADERSHIP SKILLS.

C. PREPARE WRITTEN AND ORAL COMMITTEE REPORTS AND PRESENT THEM AT FFA MEETINGS TO DEVELOP PERSONAL SKILLS AND TO FACILITATE OPERATION OF THE ORGANIZATION.

D. PARTICIPATE IN SPECIAL TRAINING PROGRAMS FOR COMMITTEE CHAIRMEN TO OBTAIN SKILLS IN COMMITTEE WORK.

5. A. ARRANGE FOR ELECTION OF FFA OFFICERS AND PARTICIPATE AS AN OFFICER, IF ELECTED.

B. PLAN, CONDUCT AND/OR PARTICIPATE IN LEADERSHIP WORKSHOPS OR OFFICER-TRAINING PROGRAMS.

C. ESTABLISH PERFORMANCE STANDARDS FOR LOCAL FFA OFFICERS.

6. A. PARTICIPATE IN CLASSROOM DISCUSSIONS, DEMONSTRATIONS, ORAL AND WRITTEN REPORTS, AND LOCAL PUBLIC SPEAKING COMPETITION.

B. ENTER PUBLIC SPEAKING CONTESTS ABOVE THE LOCAL LEVEL.

C. PARTICIPATE IN LEADERSHIP ACTIVITIES ABOVE THE LOCAL LEVEL.

D. PRACTICE MAKING FORMAL INTRODUCTIONS THROUGH ROLE PLAYING.

E. HAVE EACH STUDENT PREPARE A SHORT TALK OR SPEECH TO PRESENT IN CLASS, USING A TAPE RECORDER OR VIDEO TAPE FOR THE STUDENT TO HEAR AND/OR OBSERVE HIS PERFORMANCE.

7. CONDUCT A SELF-EVALUATION OF LEADERSHIP QUALITIES, PERSONALITY CHARACTERISTICS, AND OTHER PERSONAL ATTRIBUTES, IDENTIFYING STRONG POINTS TO BUILD UPON AND WEAK POINTS NEEDING IMPROVEMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THE QUALITIES OF A DEMOCRATIC LEADER SO THAT ATTAINMENT OF THE QUALITIES WOULD RESULT IN A PERSON DISPLAYING DEMOCRATIC LEADERSHIP.

2. DEVELOP A MATCHING TEST IN WHICH EACH STUDENT WOULD MATCH THE PARTS OF THE FFA EMBLEM WITH WHAT IT SYMBOLIZES WITH COMPLETE ACCURACY.

3. DIVIDE THE CLASS INTO GROUPS TO PRESENT A BUSINESS MEETING. THE TEACHER SHOULD EVALUATE EACH GROUP AND MEMBER AS TO THEIR POISE AND KNOWLEDGE OF PARLIAMENTARY PROCEDURE.

4. HAVE EACH MEMBER ASSIGNED RESPONSIBILITIES FOR ASSISTING IN PLANNING AND CONDUCTING THE CHAPTER PROGRAM OF ACTIVITIES. EVALUATE EACH MEMBER IN REFERENCE TO COMPLETION OF HIS ASSIGNED TASKS AND THE IMPROVEMENT THAT HE EXHIBITS OVER EACH GRADING PERIOD.

5. HAVE THE SECRETARY, TREASURER, AND REPORTER REGULARLY SUBMIT THEIR BOOKS TO THE AUDITING COMMITTEE AND TEACHER FOR EVALUATION AS TO COMPLETENESS, NEATNESS AND ACCURACY.

6. CONDUCT A PUBLIC SPEAKING CONTEST IN EACH CLASS FOR THE TEACHER TO EVALUATE EACH STUDENT FOR HIS PRESENTATION IN RELATION TO HIS SPEAKING ABILITIES.

7. HAVE EACH STUDENT COMPLETE A PERSONAL EVALUATION FORM AS TO HIS ATTITUDES TOWARD HIMSELF AND SOCIETY. THE TEACHER SHOULD PRIVATELY DISCUSS THE PERSONAL EVALUATION

WITH EACH STUDENT TO RECOGNIZE STRONG POINTS AND WEAK POINTS NEEDING IMPROVEMENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OFFICIAL FFA PARAPHERNALIA
2. OFFICIAL FFA SECRETARY'S AND TREASURER'S BOOKS
3. OFFICIAL FFA SCRAPBOOK
4. TAPE RECORDER OR VIDEO TAPE

F. EXAMPLES OF SUPPORTING REFERENCES

1. BENDER, RALPH E. THE FFA AND YOU. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1962, 494 PAGES.

   THIS TEXT COVERS ALL AREAS OF FFA PROGRAM ACTIVITIES AS WELL AS OFFICER AND MEMBER DUTIES AND RESPONSIBILITIES. IT IS AN EXCELLENT REFERENCE FOR BEGINNING MEMBERS AND OFFICERS.

2. MEMBERSHIP - PATHWAY TO LEADERSHIP. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 23 PAGES.

   AN AID FOR TEACHER UNIT PLANNING AND FOR THE STUDENT, THIS BOOKLET EMPHASIZES FUNDAMENTAL LEADERSHIP COMPETENCIES TO BE DEVELOPED BY ALL MEMBERS.

3. OFFICIAL MANUAL, FUTURE FARMERS OF AMERICA. ALEXANDRIA, VIRGINIA: FUTURE FARMERS SUPPLY SERVICE. 1972, 128 PAGES.

   THIS MANUAL WILL ASSIST BOTH MEMBERS AND ADVISORS IN GAINING AN UNDERSTANDING OF THE HISTORY, ORGANIZATION, AND OPERATION OF THE FFA.

4. STEWART, W. F. HELPS IN MASTERING PARLIAMENTARY PROCEDURE. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1969, 17 PAGES.

   A SIMPLE AND EASILY UNDERSTOOD BOOKLET CONTAINING THE BASIC RULES OF PARLIAMENTARY PROCEDURE. IT ALSO INCLUDES A QUICK REFERENCE CHART WITH REQUIREMENTS FOR EACH TYPE OF MOTION.

OUTDOOR FIRST AID

UNIT CONCEPT: EFFECTS OF PERSONAL INJURIES TO PERSONS EMPLOYED IN AGRICULTURAL RESOURCES OCCUPATIONS, ESPECIALLY THOSE WORKING IN REMOTE AREAS, CAN BE MINIMIZED WITH THE USE OF PROPER FIRST AID TECHNIQUES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE IMPORTANCE, SCOPE AND LIMITATIONS OF FIRST AID IN TREATING ACCIDENT VICTIMS IN AGRICULTURAL RESOURCES OCCUPATIONS.

2. USE THE FOLLOWING FIRST AID TECHNIQUES IN SIMULATED SITUATIONS WITH COMPETENCY INDICATED IN THE FIRST AID TEXTBOOK:

   A. TREATING WOUNDS

   B. TREATING SPRAINS AND FRACTURES

   C. TREATING FOR SHOCK

   D. TREATING POISONING

   E. TREATING POISONOUS BITES AND PLANT POISONING

   F. TREATING BURNS

   G. ADMINISTERING ARTIFICIAL RESPIRATION

   H. TRANSPORTING INJURED PERSONS

B. INSTRUCTIONAL AREAS

1. DETERMINING THE SCOPE OF FIRST AID

   A. IDENTIFYING AGRICULTURAL RESOURCES OCCUPATIONS REQUIRING FIRST AID SKILLS

   B. IDENTIFYING TYPES OF FIRST AID SKILLS NEEDED IN AGRICULTURAL RESOURCES OCCUPATIONS

   C. IDENTIFYING THE LIMITATIONS OF FIRST AID

D. IDENTIFYING INDIVIDUAL RESPONSIBILITY AND LIABILITY

2. USING FIRST AID TECHNIQUES

A. TREATING WOUNDS

(1) IDENTIFYING TYPE OF WOUND
(2) IDENTIFYING AND USING FIRST AID METHODS

B. TREATING SPRAINS AND FRACTURES

(1) IDENTIFYING SYMPTOMS
(2) IDENTIFYING AND USING FIRST AID METHODS

C. TREATING FOR SHOCK

(1) IDENTIFYING SIGNS AND SYMPTOMS
(2) IDENTIFYING CAUSES
(3) IDENTIFYING AND USING FIRST AID METHODS

D. TREATING BURNS

(1) USING FIRST AID ON THERMAL BURNS
(2) USING FIRST AID ON CHEMICAL BURNS
(3) TREATING SUNBURN AND EXCESSIVE HEAT PROBLEMS
(4) TREATING EXCESSIVE COLD PROBLEMS

E. TREATING POISONING

(1) COMMON CHEMICAL POISONS AND THEIR EFFECTS
(2) IDENTIFYING SIGNS AND SYMPTOMS
(3) ADMINISTERING FIRST AID

F. TREATING POISONOUS BITES AND PLANT POISONING

(1) IDENTIFYING THE CAUSE OF THE POISONING

(A) IDENTIFYING POISONOUS SNAKES IN THE REGION
(B) IDENTIFYING POISONOUS ARACHNIDS AND INSECTS
(C) IDENTIFYING POISONOUS PLANTS

(2) ADMINISTERING FIRST AID

G. USING ARTIFICIAL RESPIRATION

(1) DETERMINING CONDITIONS WHEN ARTIFICIAL RESPIRATION IS NEEDED
(2) ADMINISTERING ARTIFICIAL RESPIRATION

H. TRANSPORTING INJURED PERSONS

(1) IDENTIFYING SITUATIONS REQUIRING MOVEMENT OF PATIENTS

(2) PREPARING THE PATIENT
(3) IDENTIFYING METHODS OF TRANSFER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE PERSONS INVOLVED IN AGRICULTURAL RESOURCES OCCUPATIONS DISCUSS THE FIRST AID REQUIREMENTS IN THEIR OCCUPATIONS.

2. A. SET UP SIMULATED WOUNDS USING STUDENTS AS PATIENTS AND HAVE OTHERS ADMINISTER FIRST AID.

B. PRACTICE USING DIFFERENT METHODS OF ARTIFICIAL RESPIRATION WITH STUDENTS SIMULATING PATIENTS.

C. HAVE THE STUDENT PRACTICE USING AN APPROVED FIRST AID SNAKE BITE KIT UNDER SIMULATED SITUATIONS.

D. HAVE REPRESENTATIVES OF THE LOCAL RED CROSS CHAPTER, HOSPITAL OR EMERGENCY SERVICES AS RESOURCE PERSONS TO DEMONSTRATE FIRST AID EQUIPMENT, SUPPLIES AND TECHNIQUES.

E. HAVE STUDENTS FIND THE NAMES AND ADDRESSES OF AREA EMERGENCY SERVICES, POISON TREATMENT CENTERS, ETC.

F. HAVE STUDENTS PREPARE A BULLETIN BOARD SHOWING POISONOUS AND NON-POISONOUS SNAKES, SPIDERS AND INSECTS COMMON TO THE AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS LIST FIVE AGRICULTURAL RESOURCES OCCUPATIONS AND AT LEAST FOUR FIRST AID REQUIREMENTS FOR EACH OCCUPATION.

2. HAVE EACH STUDENT DEMONSTRATE AT LEAST FOUR FIRST AID SKILLS ASSIGNED BY THE TEACHER. EVALUATE THE STUDENTS AS TO CORRECTNESS OF PROCEDURE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. FIRST AID KITS

2. SNAKE BITE KITS

F. EXAMPLES OF SUPPORTING REFERENCES

1. COLLINS, HENRY HILL, JR. COMPLETE FIELD GUIDE TO AMERICAN WILDLIFE. NEW YORK, NEW YORK: HARPER AND ROWE PUBLISHERS, INC. 1959, 683 PAGES.

   THIS TEXT CONTAINS INFORMATION AND COLOR PICTURES OF THE POISONOUS SNAKES FOUND IN THE UNITED STATES.

2. FIRST AID TEXTBOOK. WASHINGTON, D.C.: THE AMERICAN NATIONAL RED CROSS. 1957, 249 PAGES.

   THIS TEXT WILL BE A VALUABLE REFERENCE FOR THE TEACHER AND STUDENT WHILE LEARNING AND PRACTICING FIRST AID TECHNIQUES.

OPERATION AND CARE OF SMALL GASOLINE ENGINES

UNIT CONCEPT: PROPER STARTING, OPERATION, CLEANING, AND STORAGE OF SMALL GASOLINE ENGINES WILL RESULT IN INCREASED ENGINE EFFICIENCY AND LONGER LIFE WITH A MINIMUM OF ANNOYANCE AND EXPENSE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE TWO BASIC TYPES OF SMALL GASOLINE ENGINES AND EXPLAIN THEIR PRINCIPLES OF OPERATION WITH ACCURACY NEEDED TO DIFFERENTIATE BETWEEN THEM.

2. USE THE PROPER PROCEDURES FOR PREPARING TO START AND STARTING A SMALL GASOLINE ENGINE INCLUDING REFUELING TO PREVENT STARTING TROUBLES AND ACCIDENTS.

3. OPERATE, ADJUST ENGINE SPEED AND LOAD, AND STOP SMALL GASOLINE ENGINES USING PROCEDURES WHICH PROMOTE OPTIMUM ENGINE EFFICIENCY AND OPERATOR SAFETY.

4. PROPERLY CLEAN A SMALL GASOLINE ENGINE TO PREVENT OVER-HEATING AND EXCESSIVE WEAR DUE TO DIRT ENTERING THE ENGINE.

5. PREPARE A SMALL GASOLINE ENGINE PROPERLY FOR STORAGE OF THREE OR MORE MONTHS DURATION TO PREVENT CORROSION AND DAMAGE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING TYPES OF SMALL GASOLINE ENGINES

   A. IDENTIFYING OPERATING PRINCIPLES OF FOUR STROKE CYCLE ENGINES

   B. IDENTIFYING OPERATING PRINCIPLES OF TWO STROKE CYCLE ENGINES

   C. IDENTIFYING SPECIFIC USES OF EACH TYPE OF ENGINE

2. PREPARING SMALL GASOLINE ENGINES FOR STARTING

   A. REFUELING

(1) SELECTING THE FUEL
(2) MIXING THE OIL-GASOLINE MIXTURE FOR A TWO STROKE CYCLE ENGINE
(3) FILLING THE TANK USING PROPER SAFETY PRECAUTIONS

B. STARTING

(1) IDENTIFYING SAFETY PRECAUTIONS
(2) CHECKING REQUIRED SERVICING
(3) OPERATING STARTING MECHANISMS

3. OPERATING A SMALL GASOLINE ENGINE

A. SELECTING PROPER SPEED

B. SELECTING PROPER LOAD

C. CORRELATING ENGINE TYPE TO SLOPE AND OTHER WORKING CONDITIONS

D. STOPPING THE ENGINE

4. CLEANING SMALL GASOLINE ENGINES

A. CLEANING THE OUTSIDE OF THE ENGINE

B. CLEANING THE MUFFLER AND/OR EXHAUST PORTS

C. CLEANING THE COOLING SYSTEM

5. STORING THE ENGINE

A. PREVENTING CORROSION AND MOISTURE BUILD-UP

B. PREVENTING GUM DEPOSITS

C. PREVENTING DUST BUILD-UP AND PHYSICAL DAMAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USE CUT AWAY MODELS OF TWO AND FOUR CYCLE ENGINES TO OBSERVE DIFFERENCES IN THEIR OPERATING PRINCIPLES.

2. A. MAKE A CHECK LIST OF SAFETY PROCEDURES TO FOLLOW BEFORE, DURING, AND AFTER STARTING A SMALL ENGINE.

B. PREPARE A FUEL MIXTURE FOR A TWO STROKE CYCLE ENGINE.

3. COMPARE OPERATING INSTRUCTIONS IN OPERATORS' MANUALS OF TWO AND FOUR STROKE CYCLE ENGINES AND NOTE DIFFERENCES IN RECOMMENDATIONS.

4. BRING IN EXAMPLES OF POORLY CARED FOR ENGINES FOR THE STUDENTS TO CLEAN.

5. USE A SMALL GASOLINE ENGINE THAT WILL BE STORED FOR A LONG PERIOD OF TIME TO DEMONSTRATE CORRECT PROCEDURES TO USE TO PREPARE AN ENGINE FOR STORAGE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP AN ESSAY TEST IN WHICH THE STUDENTS WILL INDICATE THE BASIC DIFFERENCES BETWEEN TWO AND FOUR STROKE CYCLE ENGINES.

2. HAVE THE STUDENTS LIST THE PROCEDURES TO FOLLOW WHEN REFUELING SMALL GASOLINE ENGINES WHICH SHOULD INCLUDE SAFETY PRECAUTIONS.

3. HAVE EACH STUDENT OPERATE A SMALL GASOLINE ENGINE UNDER WORKING CONDITIONS. EVALUATE THE STUDENT IN RELATION TO PROPER LOAD AND SPEED ADJUSTMENT AND SAFETY PROCEDURES.

4. HAVE THE STUDENTS LIST THE PROCEDURES THAT SHOULD BE FOLLOWED WHICH WILL HELP PREVENT ENTRANCE OF DIRT INTO THE ENGINE.

5. HAVE THE STUDENTS DESCRIBE THE PROCEDURE THEY WOULD FOLLOW TO PREPARE A SMALL GASOLINE ENGINE FOR STORAGE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SMALL ENGINE HAND TOOLS

2. CUT AWAY MODELS OF TWO AND FOUR STROKE CYCLE ENGINES

3. AIR COMPRESSOR

4. "DEGREASER" SOLVENTS

5. SMALL ENGINES IN GOOD AND POOR CONDITION

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMALL ENGINES. VOLUME I. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1968, 150 PAGES.

   THIS BOOKLET CONTAINS A COMPLETE DISCUSSION OF PROCEDURES FOR OPERATING AND CARING FOR SMALL GASOLINE ENGINES AND WOULD BE OF VALUE AS A STUDENT TEXT.

MAINTENANCE OF SMALL GASOLINE ENGINES

UNIT CONCEPT: REGULAR MAINTENANCE WHICH INCLUDES CLEANING THE CARBURETOR AIR CLEANER, CLEANING THE FUEL STRAINER, SELECTING AND CHANGING CRANKCASE OIL, AND SERVICING THE SPARK PLUG IS NEEDED TO OBTAIN TROUBLE-FREE SERVICE, GREATER ENGINE EFFICIENCY, AND LONGER LIFE FROM SMALL GASOLINE ENGINES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE DIFFERENT TYPES OF CARBURETOR AIR CLEANERS COMMONLY FOUND ON SMALL GASOLINE ENGINES AND CLEAN AND SERVICE THEM ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

2. IDENTIFY THE THREE BASIC TYPES OF FUEL STRAINERS COMMONLY FOUND ON SMALL GASOLINE ENGINES AND CLEAN AND SERVICE THEM ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

3. SELECT THE RIGHT OIL, KEEP THE PROPER CRANKCASE OIL LEVEL, AND CHANGE THE OIL IN A FOUR STROKE CYCLE ENGINE ACCORDING TO MANUFACTURER'S SPECIFICATIONS FOR SMALL GASOLINE ENGINES.

4. SELECT AND SERVICE THE SPARK PLUG ON TWO AND FOUR STROKE CYCLE ENGINES ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

5. IDENTIFY THE PRINCIPLES OF CARBURETOR OPERATION IN SMALL GASOLINE ENGINES AND MAKE CARBURETOR ADJUSTMENTS FOR MOST EFFICIENT PERFORMANCE.

B. INSTRUCTIONAL AREAS

1. SERVICING CARBURETOR AIR CLEANERS

   A. IDENTIFYING THE TYPES OF CARBURETOR AIR CLEANERS

      (1) OIL-BATH TYPE
      (2) OILED-FILTER TYPE
      (3) DRY-FILTER TYPE

B. IDENTIFYING REASONS FOR SERVICING AIR CLEANERS

C. IDENTIFYING METHODS OF SERVICING EACH AIR CLEANER TYPE

2. SERVICING FUEL STRAINERS

A. IDENTIFYING TYPES OF FUEL STRAINERS

B. IDENTIFYING PROCEDURES FOR CLEANING FUEL STRAINERS

3. LUBRICATING FOUR STROKE CYCLE ENGINES

A. DETERMINING THE IMPORTANCE OF PROPER LUBRICATION

B. SELECTING CRANKCASE OIL

(1) SINGLE VISCOSITY OILS
(2) MULTI-VISCOSITY OILS

C. CHANGING CRANKCASE OIL

D. CHECKING CRANKCASE OIL LEVEL

4. SERVICING SPARK PLUGS

A. IDENTIFYING THE TYPES OF SPARK PLUGS

(1) HOT AND COLD PLUGS
(2) LENGTH OF REACH

B. SELECTING THE PROPER PLUG TO MEET ENGINE CONDITIONS

C. INSPECTING AND MAINTAINING SPARK PLUGS

5. ADJUSTING CARBURETORS

A. IDENTIFYING THE BASIC PRINCIPLES OF CARBURETION

B. IDENTIFYING THE COMMON TYPES OF SMALL GASOLINE ENGINE CARBURETORS

C. MAKING CARBURETOR ADJUSTMENTS

(1) IDLE SPEED SCREW
(2) LOW SPEED NEEDLE
(3) HIGH SPEED NEEDLE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. DEMONSTRATE THE EFFECTS OF A DIRTY AIR CLEANER ON ENGINE PERFORMANCE BY PARTIALLY BLOCKING THE AIR INTAKE TO THE

CARBURETOR AND LISTENING TO THE RESULTING ENGINE PERFORMANCE AND OBSERVING THE EFFECTS ON THE ENGINE'S POWER.

2. PRACTICE CLEANING DIFFERENT TYPES OF FUEL STRAINERS.

3. A. CONDUCT A DEMONSTRATION USING VARIOUS VISCOSITY GRADES OF OIL AND DETERGENT AND NON-DETERGENT OIL TO INDICATE DIFFERENCES IN OIL PERFORMANCE UNDER DIFFERENT ENGINE CONDITIONS.

   B. CHANGE THE OIL IN A FOUR STROKE CYCLE ENGINE.

4. CLEAN AND SET A SPARK PLUG ACCORDING TO THE OPERATOR'S MANUAL USING A FEELER GAUGE.

5. A. DETERMINE IF THE CARBURETOR ON A SMALL GASOLINE ENGINE IS FUNCTIONING PROPERLY BY STARTING THE ENGINE AND OBSERVING PERFORMANCE AND EXHAUST WHEN THE THROTTLE IS RAPIDLY ADVANCED.

   B. PRACTICE ADJUSTING ENGINE CARUBRETORS ACCORDING TO MANUFACTURER'S SPECIFICATIONS AND BY OBSERVING ENGINE PERFORMANCE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT SERVICE AN AIR CLEANER ON A SMALL GASOLINE ENGINE. EVALUATE THE STUDENT ON HIS CORRECTNESS OF PROCEDURE.

2. HAVE EACH STUDENT LIST THE STEPS TO FOLLOW WHEN SERVICING THE FUEL STRAINER ON A SMALL GASOLINE ENGINE.

3. HAVE EACH STUDENT LIST THE STEPS IN CHANGING OIL IN A SMALL GASOLINE ENGINE.

4. GIVE EACH STUDENT A DIRTY OR WORN SPARK PLUG TO SERVICE OR REPLACE. EVALUATE THE STUDENT ON CORRECTNESS OF PROCEDURE IN SERVICING THE PLUG OR ON SELECTING THE APPROPRIATE REPLACEMENT PLUG.

5. MAKE MALADJUSTMENTS ON A SMALL ENGINE CARBURETOR. HAVE EACH STUDENT RESET THE CARBURETOR SO THAT THE ENGINE RUNS SMOOTHLY AND EFFICIENTLY. EVALUATE THE STUDENT AS TO CORRECTNESS IN PROCEDURE AND THE RESULTING CARBURETOR AND ENGINE PERFORMANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SMALL GASOLINE ENGINES

2. COMMON SMALL GASOLINE ENGINE HAND TOOLS
3. SPARK PLUG FEELER GAUGE
4. CONTAINERS FOR WASHING PARTS
5. DIFFERENT TYPES AND GRADES OF OIL
6. PETROLEUM SOLVENT
7. EXAMPLES OF SPARK PLUGS
8. OPERATOR'S MANUALS
9. IGNITION FILE

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMALL ENGINES. VOLUME I. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION OF VOCATIONAL INSTRUCTIONAL MATERIALS. 1968, 150 PAGES.

   THIS BOOKLET CONTAINS A COMPLETE DISCUSSION OF MAINTENANCE PROCEDURES FOR SMALL GASOLINE ENGINES AND WOULD BE VALUABLE AS A STUDENT TEXT.

OPERATION AND MAINTENANCE OF GASOLINE AND DIESEL POWER UNITS

UNIT CONCEPT: REGULAR MAINTENANCE OF POWER UNITS INCLUDING DAILY LUBRICATION, MAINTENANCE OF THE OIL AND COOLING SYSTEMS, AND PROPER OPERATION OF THE UNITS WILL RESULT IN GREATER ENGINE EFFICIENCY, LONGER ENGINE LIFE AND INCREASED OPERATOR SAFETY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE PRINCIPLES OF OPERATION OF GASOLINE AND DIESEL POWER UNITS WITH ACCURACY NEEDED TO DETERMINE WHICH TYPE OF ENGINE A SPECIFIED UNIT HAS.

2. SELECT AND MAINTAIN BATTERIES FOR POWER UNITS INCLUDING USE OF A HYDROMETER TO TEST BATTERY ELECTRICAL CONDITION TO OBTAIN OPTIMUM BATTERY PERFORMANCE WITH A MINIMUM OF UNNECESSARY WEAR OR DAMAGE.

3. IDENTIFY PARTS OF POWER UNITS REQUIRING FREQUENT GREASING, SELECT GREASE AND GREASE UNITS ACCORDING TO SPECIFICATIONS IN THE OPERATOR'S MANUAL.

4. MAINTAIN DRY-TYPE AND OIL BATH AIR CLEANERS ACCORDING TO OPERATOR'S MANUAL SPECIFICATIONS.

5. SELECT APPROPRIATE OIL, MAINTAIN OIL LEVELS AND CHANGE OIL WHEN NECESSARY IN THE CRANKCASE, TRANSMISSION AND HYDRAULIC SYSTEMS IN GASOLINE AND DIESEL POWER UNITS ACCORDING TO THE OPERATOR'S MANUAL.

6. MAINTAIN THE COOLING SYSTEM ON GASOLINE AND DIESEL POWER UNITS TO PREVENT FREEZING, OVERHEATING, CORROSION AND DEPOSITS.

7. SELECT AND MAINTAIN SPARK PLUGS FOR GASOLINE POWER UNITS ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

8. REFUEL GASOLINE AND DIESEL POWER UNITS IN A MANNER WHICH WILL AVOID FIRE HAZARDS AND FOREIGN MATERIAL IN THE FUEL SYSTEM.

9. SAFELY START, OPERATE AND STOP TRACTORS, CRAWLERS AND OTHER COMMONLY USED POWER UNITS AS DIRECTED IN THE OPERATORS' MANUALS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING PRINCIPLES OF ENGINE OPERATION

   A. IDENTIFYING PRINCIPLES OF GASOLINE ENGINES

   B. IDENTIFYING PRINCIPLES OF DIESEL ENGINES

2. SERVICING BATTERIES

   A. SELECTING REPLACEMENT BATTERIES

      (1) DETERMINING POWER REQUIREMENTS
      (2) DETERMINING OPERATING CONDITIONS

   B. MAINTAINING BATTERIES

      (1) MAINTAINING LIQUID LEVEL
      (2) MAINTAINING TERMINALS AND CLAMPS
      (3) USING A HYDROMETER TO CHECK ELECTRICAL CONDITION
      (4) RECHARGING BATTERIES

3. GREASING POWER UNITS

   A. SELECTING GREASE

   B. IDENTIFYING PARTS REQUIRING GREASE

   C. LOCATING GREASE FITTINGS

   D. USING A GREASE GUN

   E. DEVELOPING A LUBRICATION SCHEDULE

4. MAINTAINING AIR CLEANERS

   A. MAINTAINING DRY TYPE CLEANERS

   B. MAINTAINING OIL BATH TYPE CLEANERS

5. MAINTAINING THE HYDRAULIC, TRANSMISSION AND CRANKCASE OIL SYSTEMS

   A. SELECTING OIL

   B. MAINTAINING PROPER OIL LEVEL

C. CHANGING OIL

D. CHANGING OIL FILTERS

6. MAINTAINING THE COOLING SYSTEM

A. SELECTING COOLANT

B. MAINTAINING PROPER COOLANT LEVEL

C. PREVENTING CORROSION AND DEPOSITS

D. PREVENTING FREEZING AND OVERHEATING

E. CLEANING THE COOLING SYSTEM

7. MAINTAINING SPARK PLUGS

A. SELECTING SPARK PLUGS TO MEET ENGINE SPECIFICATIONS

B. CLEANING AND CONDITIONING PLUGS

C. SETTING THE GAP

8. REFUELING GASOLINE AND DIESEL UNITS

A. SELECTING FUEL

B. KEEPING OUT DIRT AND MOISTURE

C. AVOIDING FIRE HAZARDS

D. REMOVING WATER FROM DIESEL FUEL SYSTEMS

9. OPERATING GASOLINE AND DIESEL POWER UNITS

A. STARTING GASOLINE AND DIESEL UNITS

(1) IDENTIFYING SAFETY PRECAUTIONS
(2) IDENTIFYING STARTING PROCEDURES

B. OPERATING POWER UNITS

(1) IDENTIFYING SAFETY PRECAUTIONS
(2) OPERATING POWER TAKE-OFF EQUIPMENT
(3) HITCHING EQUIPMENT TO TRACTORS, CRAWLERS AND OTHER UNITS
(4) ADJUSTING ENGINE SPEED TO LOAD
(5) OPERATING POWER UNITS UNDER VARYING FIELD CONDITIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. OBSERVE GASOLINE AND DIESEL UNITS TO COMPARE DIFFERENCES IN METHODS OF SUPPLYING FUEL TO THE CYLINDERS, IGNITION SYSTEMS, ETC.

2. A. USE A HYDROMETER TO PRACTICE CHECKING THE ELECTRICAL CONDITION OF BATTERIES WHICH HAVE BEEN USED UNDER VARYING FIELD CONDITIONS.

   B. CONSTRUCT A SIMPLE BATTERY USING A BEAKER, SULFURIC ACID SOLUTION, AND ZINC AND COPPER STRIPS. USE VOLTMETERS AND AMMETERS TO MEASURE VOLTAGE AND AMPERAGE PRODUCED.

3. HAVE THE STUDENTS DIAGRAM THE POWER UNITS THEY WILL BE WORKING WITH AND INDICATE THE LOCATION OF THE GREASE FITTINGS NEEDING FREQUENT GREASING.

4. HAVE PAIRS OF STUDENTS DEMONSTRATE TO THE REMAINDER OF THE CLASS HOW TO SERVICE EACH TYPE OF AIR CLEANER FOUND ON GASOLINE AND DIESEL POWER UNITS.

5. COMPARE OIL VISCOSITY, GRADE, ETC., USED IN THE HYDRAULIC, TRANSMISSION AND CRANKCASE OIL SYSTEMS TO INDICATE THE IMPORTANCE OF CORRECT OIL SELECTION.

6. A. PLACE A THERMOSTAT IN HOT AND COLD WATER TO INDICATE HOW IT CONTROLS ENGINE COOLANT TEMPERATURE.

   B. SET UP A DEMONSTRATION WITH COOLANT AND TWO OR MORE DIFFERENT METALS SUCH AS STAINLESS STEEL, BRASS, SOLDER OR ALUMINUM AND COPPER CONNECTED BY A COPPER WIRE. OBSERVE THE BATTERY ACTION WHICH CAUSES ONE OF THE METALS TO BE EATEN AWAY.

7. USE A SPARK PLUG GAUGE TO PRACTICE SETTING THE GAP ON SPARK PLUGS.

8. A. MIX WATER AND DIESEL FUEL TOGETHER AND GASOLINE AND WATER TO OBSERVE THE DIFFERENCES IN SETTING OUT OF THE WATER AND TO EMPHASIZE THE IMPORTANCE OF DRAINING OFF WATER FROM A DIESEL ENGINE BEFORE STARTING.

   B. DEVELOP A HOME SYSTEM OF STORING FUELS AND LUBRICANTS OBSERVING NECESSARY SAFETY PRECAUTIONS.

9. A. OBTAIN STATISTICS WHICH INDICATE NUMBERS OF AGRICULTURALLY-RELATED ACCIDENTS EACH YEAR AND THEIR CAUSES. DETERMINE WHICH ONES MIGHT HAVE BEEN PREVENTED BY OBSERVING SAFETY PRECAUTIONS WHILE STARTING, OPERATING OR STOPPING POWER UNITS.

B. HAVE STUDENTS ENROLL IN VOCATIONAL AGRICULTURE OR 4-H TRACTOR OR FARM SAFETY PROGRAM.

C. HAVE STUDENTS OPERATE TRACTORS, CRAWLERS, ETC., UNDER VARIOUS CONDITIONS BY SETTING UP A COURSE THROUGH WHICH THE STUDENTS MUST MANEUVER TO DEMONSTRATE THEIR ABILITIES.

D. USE AN ELECTRIC DRILL TO DEMONSTRATE POWER TAKE-OFF SAFETY.

E. USE MODEL TRACTORS AND CRAWLERS TO DEMONSTRATE HOW TIPPING ACCIDENTS OCCUR.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PRESENT THE STUDENTS WITH DESCRIPTIONS OF A NUMBER OF ENGINES. HAVE THE STUDENTS INDICATE FROM THE DESCRIPTION WHETHER EACH IS A GASOLINE OR DIESEL POWER UNIT.

2. HAVE EACH STUDENT TEST A BATTERY USING A HYDROMETER WITH EVALUATION TO BE BASED ON CORRECTNESS OF PROCEDURE AND ACCURACY.

3. GIVE THE STUDENTS A DIAGRAM OF A COMMONLY USED TRACTOR OR CRAWLER. HAVE THEM INDICATE ON THE DIAGRAM THE APPROXIMATE LOCATION OF THE GREASE FITTINGS WITH A MINIMUM OF 90% ACCURACY.

4. HAVE EACH STUDENT SERVICE A DRY TYPE OR OIL BATH AIR CLEANER FOR EVALUATION. PROCEDURES USED SHOULD BE THOSE INDICATED IN THE OPERATOR'S MANUAL.

5. HAVE EACH STUDENT CHANGE THE OIL AND OIL FILTER, IF NECESSARY, ON A POWER UNIT. EVALUATE THE STUDENT AS TO CORRECTNESS OF PROCEDURE AND SELECTION OF THE APPROPRIATE OIL AND FILTER.

6. HAVE THE STUDENTS LIST THE CORRECT PROCEDURES FOR MAINTAINING AN ENGINE COOLING SYSTEM WHICH WILL PREVENT OVERHEATING, FREEZING, CORROSION AND DEPOSITS.

7. GIVE EACH STUDENT DIRTY OR WORN SPARK PLUGS TO SERVICE. THE PLUG GAP SHOULD BE WITHIN ± .002" OF THE SETTING RECOMMENDED IN THE OPERATOR'S MANUAL.

8. HAVE THE STUDENTS LIST THE PROCEDURES THAT SHOULD BE FOLLOWED WHEN REFUELING A GASOLINE OR DIESEL POWER UNIT. THE PROCEDURES LISTED SHOULD INCLUDE SAFETY PROCEDURES AS WELL AS THOSE WHICH WOULD HELP PROTECT THE FUEL SYSTEM FROM WATER AND OTHER FOREIGN MATTER.

9. HAVE EACH STUDENT DRIVE A TRACTOR OR CRAWLER AND IMPLEMENT THROUGH A COURSE WHICH WOULD REQUIRE OPERATOR SKILLS COMPARABLE TO THOSE NEEDED IN THE FIELD. EVALUATE THE STUDENT ON HIS SKILLS AND OBSERVANCE OF SAFETY PRECAUTIONS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HYDROMETER
2. BEAKER
3. METAL STRIPS - ZINC, COPPER, STAINLESS STEEL, BRASS, SOLDER
4. SULFURIC ACID SOLUTION
5. COOLANT
6. VARIOUS TYPES OF OIL
7. SPARK PLUG FEELER GAUGE
8. VOLTMETERS AND AMMETERS
9. THERMOSTAT
10. ELECTRIC DRILL
11. MODELS OF TRACTORS AND CRAWLERS
12. TRACTOR AND/OR CRAWLER
13. BATTERIES
14. GREASE GUN AND GREASE
15. WRENCHES, SOCKETS AND OTHER ENGINE TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. OPERATING FARM TRACTORS AND MACHINERY, EFFICIENTLY, SAFELY. AMES, IOWA: PUBLICATIONS DISTRIBUTION CENTER, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY. 1969, 81 PAGES.

   ALTHOUGH THIS PUBLICATION IS ORIENTED TOWARD FARM TRACTOR AND MACHINERY OPERATION, THE MATERIAL PROVIDES

PRINCIPLES OF OPERATION WHICH WOULD APPLY TO MOST SITUATIONS WHERE POWER UNITS AND EQUIPMENT ARE BEING USED.

2. TRACTOR MAINTENANCE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, 145 PAGES.

   THIS BOOKLET IS DESIGNED TO PROVIDE MAINTENANCE INFORMATION FOR TRACTORS, BUT WOULD BE USEFUL FOR WORK WITH MOST POWER UNITS.

3. TRACTOR OPERATION AND DAILY CARE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1967, 120 PAGES.

   THIS BOOKLET WOULD BE A VALUABLE STUDENT REFERENCE. IT CONTAINS INFORMATION THAT WOULD BE USEFUL IN OPERATING AND CARING FOR GASOLINE AND DIESEL POWER UNITS.

II

FISH

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FISH MANAGEMENT IN LAKES, PONDS AND STREAMS

FISH HATCHERY OPERATION AND MAINTENANCE

FISH MANAGEMENT IN LAKES, PONDS AND STREAMS

UNIT CONCEPT: WITHOUT COMPETENT FISH MANAGEMENT, THE QUANTITY AND QUALITY OF FISH PRODUCED IN WATERWAYS AND WATER IMPOUNDMENTS WILL BE INADEQUATE TO MEET PUBLIC DEMAND. SUCCESSFUL MANAGEMENT OF A FISH POPULATION REQUIRES A WORKING KNOWLEDGE OF FISH CHARACTERISTICS, THE RELATIONSHIP OF WATER QUALITY AND FISH PRODUCTION, AND METHODS OF CONTROLLING THE FISH, WATER AND WATERSHED VARIABLES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIED WATER IMPOUNDMENT OR WATERWAY IN HIS AREA, IDENTIFY THE MAJOR FISH SPECIES THAT ARE FOUND THERE.

2. WHEN GIVEN A SPECIFIED WATERWAY OR WATER IMPOUNDMENT, DETERMINE THE FOLLOWING CHEMICAL PROPERTIES OF THE WATER WITH THE SPECIFIED LEVEL OF ACCURACY:

   A. DISSOLVED OXYGEN - WITHIN ± 2 PARTS PER MILLION

   B. PH - WITHIN ± 1 PH LEVEL

   C. WATER POLLUTANTS (NATURAL AND MAN-MADE) - WITHIN THE STANDARDS FOR THE PARTICULAR TEST KIT

3. WHEN GIVEN A SPECIFIED WATER IMPOUNDMENT OR WATERWAY, DETERMINE THE FOLLOWING PHYSICAL CHARACTERISTICS OF THE WATER WITH THE SPECIFIED LEVEL OF ACCURACY:

   A. WATER TEMPERATURE AT DIFFERENT DEPTHS - WITHIN ± 3° FAHRENHEIT

   B. TURBIDITY OF THE WATER - TO THE SATISFACTION OF THE INSTRUCTOR

   C. FERTILITY OF THE WATER - WITHIN ONE UNIT ON THE MEASURING INSTRUMENT

   D. PRESENCE OF ALGAE AND/OR WATERWEEDS

4. BY OBSERVING THE RELATIVE NUMBERS AND SIZES OF THE DIFFERENT FISH SPECIES IN A WATER IMPOUNDMENT OR WATERWAY, DETERMINE THE BALANCE OF THE FISH POPULATION WITH ACCURACY NEEDED TO DEVELOP SPECIFIC MANAGEMENT RECOMMENDATIONS.

5. USING THE DATA OBTAINED THROUGH A CHEMICAL AND PHYSICAL ANALYSIS OF THE WATER AND AN ANALYSIS OF THE FISH POPULATION PRESENT, DESCRIBE THE STEPS THAT SHOULD BE TAKEN TO CORRECT ANY FISH IMBALANCE THAT IS PRESENT IN THE WATER IMPOUNDMENT OR WATERWAY.

6. USING THE DATA OBTAINED THROUGH A CHEMICAL AND PHYSICAL ANALYSIS OF THE WATER AND AN ANALYSIS OF ANY FISH POPULATIONS PRESENT, SELECT AND IMPLEMENT A STOCKING PROGRAM WHICH WOULD INCLUDE SPECIES, SIZE, AND METHOD OF STOCKING TO BE USED.

7. USING FISH BALANCE, STOCKING INFORMATION, AND ANY OTHER PERTINENT INFORMATION, DEVELOP A FISH HARVEST SCHEDULE FOR A WATER IMPOUNDMENT OR WATERWAY WHICH WILL PROMOTE HEALTHY, VIGOROUS FISH AND GOOD FISHING.

8. FOR A GIVEN WATER IMPOUNDMENT OR WATERWAY, RECOMMEND WATERSHED MANAGEMENT PROCEDURES WHICH SHOULD BE IMPLEMENTED TO CONTROL EXCESSIVE SEDIMENTATION AND WATER POLLUTION.

9. UPON IDENTIFYING THE SPECIES OF WEEDS OR ALGAE IN A WATER IMPOUNDMENT, SELECT AND IMPLEMENT A CONTROL PROGRAM WHICH WILL ELIMINATE THE PROBLEM AND HELP PREVENT FUTURE PROBLEMS.

10. WHERE ECONOMICALLY FEASIBLE, FERTILIZE A WATER IMPOUNDMENT USING RECOMMENDED RATES AND ANALYSES SO THAT FISH PRODUCTION WILL BE ENHANCED.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING SPECIES OF FISHES

   A. FRESHWATER FISH

      (1) GAME FISH
      (2) PAN FISH
      (3) BAIT FISH
      (4) TRASH FISH

   B. SALTWATER FISH

2. MAKING A CHEMICAL WATER ANALYSIS

A. DETERMINING DISSOLVED OXYGEN LEVEL

B. TESTING FOR PH LEVEL

C. TESTING FOR WATER POLLUTANTS

(1) IDENTIFYING THE POLLUTANTS PRESENT
(2) DETERMINING THE AMOUNTS OF POLLUTANTS PRESENT

3. MAKING A PHYSICAL WATER ANALYSIS

A. DETERMINING WATER TEMPERATURE

(1) MEASURING DESIRED DEPTH
(2) CORRECTLY READING THE SCALE

B. OBSERVING WATER TURBIDITY

C. MEASURING WATER FERTILITY

D. IDENTIFYING ALGAE AND WEED PROBLEMS

4. DETERMINING FISH BALANCE

A. SEINING

(1) SELECTING THE SEINE
(2) OPERATING THE SEINE

B. ESTIMATING FISH POPULATIONS

(1) OBSERVING NUMBERS PRESENT
(2) OBSERVING FISH SIZE

5. CORRECTING FISH IMBALANCES

A. SEINING

B. USING FISH TRAPS

C. DESTROYING NESTS

D. USING FISH TOXICANTS FOR PARTIAL POPULATION REDUCTION

E. CHANGING HARVEST SCHEDULES

6. STOCKING WATER IMPOUNDMENTS AND WATERWAYS

A. EVALUATING AVAILABLE DATA

B. SELECTING SPECIES TO USE

C. DETERMINING SIZE OF FISH TO STOCK

D. DETERMINING STOCKING METHOD

7. SETTING THE HARVESTING SCHEDULE

A. DETERMINING FISHING SEASON AND INTENSITY

B. CONTROLLING FISH REMOVAL

8. MANAGING THE WATERSHED

A. PLANTING COVER CROPS

B. PLANTING TREES AND SHRUBS

C. CONTROLLING GRAZING

D. IDENTIFYING PROTECTIVE CROPPING SYSTEMS

9. CONTROLLING WATERWEEDS AND ALGAE

A. IDENTIFYING THE SPECIES PRESENT

B. IDENTIFYING ALTERNATE CONTROL METHODS

(1) MECHANICAL
(2) CHEMICAL
(3) BIOLOGICAL

C. CHEMICALLY CONTROLLING WATERWEEDS AND ALGAE

(1) SELECTING THE APPROPRIATE CHEMICAL
(2) APPLYING THE CHEMICAL
(3) MAINTAINING THE EQUIPMENT
(4) OBSERVING SAFETY PRECAUTIONS

10. FERTILIZING WATER IMPOUNDMENTS TO IMPROVE FISH PRODUCTION

A. DETERMINING THE ECONOMIC FEASIBILITY

B. DETERMINING AMOUNTS TO BE APPLIED

(1) SELECTING ANALYSIS
(2) DETERMINING RATE OF APPLICATION

C. USING APPLICATION METHODS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS DEVELOP A BULLETIN BOARD DISPLAY OF THE MAJOR FISH SPECIES FOUND IN THEIR AREA.

2. HAVE THE STUDENTS BRING IN SAMPLES OF WATER FROM WATERWAYS AND WATER IMPOUNDMENTS TO PRACTICE TESTING THE CHEMICAL PROPERTIES.

3. TAKE FIELD TRIPS TO NEARBY WATERWAYS AND WATER IMPOUNDMENTS TO PRACTICE RECOGNIZING AND MEASURING PHYSICAL CHARACTERISTICS.

4. SEINE THE EDGES OF SMALL WATER IMPOUNDMENTS TO OBSERVE FISH SPECIES AND NUMBERS PRESENT FOR DETERMINING THE FISH BALANCE.

5. HAVE A FISH OR GAME WARDEN DISCUSS WITH THE STUDENTS STEPS THAT MAY BE TAKEN TO CORRECT FISH IMBALANCES.

6. HAVE THE STUDENTS ASSIST A FISH OR GAME WARDEN IN STOCKING FISH IN WATERWAYS OR WATER IMPOUNDMENTS.

7. HAVE THE STUDENTS DISCUSS WITH A FISH OR GAME WARDEN THE FACTORS TO CONSIDER WHEN DETERMINING THE FISHING PRESSURE ALLOWED ON A WATERWAY OR WATER IMPOUNDMENT.

8. TAKE A FIELD TRIP WITH A SOIL CONSERVATION SERVICE TECHNICIAN TO A WATERWAY OR WATER IMPOUNDMENT TO OBSERVE AND DISCUSS WATERSHED MANAGEMENT TECHNIQUES.

9. HAVE THE STUDENTS DEVELOP AND IMPLEMENT AN ALGAE AND WEED CONTROL PROGRAM ON THE LAND LABORATORY POND OR ON A COOPERATOR'S POND.

10. IF POND FERTILIZATION IS ECONOMICALLY FEASIBLE IN THE AREA, HAVE THE STUDENTS DEVELOP AND IMPLEMENT A FERTILIZATION PROGRAM FOR THE LAND LABORATORY POND OR FOR A COOPERATOR'S POND.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING SPECIMENS, PICTURES OR SLIDES, DEVELOP A PRACTICAL EXAMINATION IN WHICH THE STUDENTS ARE TO IDENTIFY AT LEAST FIFTEEN SPECIES OF FISH COMMON TO THEIR REGION.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO PROPERLY COLLECT A WATER SAMPLE AND TEST THE CHEMICAL COMPOSITION OF THE WATER WITH ACCURACY AS SPECIFIED IN THE PERFORMANCE OBJECTIVES.

3. ON A SPECIFIED WATER IMPOUNDMENT, HAVE EACH STUDENT DETERMINE THE PHYSICAL CHARACTERISTICS OF THE WATER WITH ACCURACY AS SPECIFIED IN THE PERFORMANCE OBJECTIVES.

4. UPON SEINING THE EDGE OF A POND, HAVE EACH STUDENT WRITE HIS OBSERVATIONS AS TO THE BALANCE OF THE FISH POPULATION PRESENT.

5. HAVE EACH STUDENT LIST HIS RECOMMENDATIONS FOR CORRECTING THE FISH IMBALANCE IN A SEINED POND OR FOR HYPOTHETICAL INFORMATION GIVEN BY THE INSTRUCTOR CONCERNING THE FISH POPULATION IN A POND.

6. USING DATA OBTAINED FROM A NEARBY WATERWAY OR WATER IMPOUNDMENT, HAVE EACH STUDENT DEVELOP A FISH STOCKING PLAN WHICH INCLUDES SPECIES, SIZE OF FISH, AND STOCKING METHOD.

7. UPON DETERMINING ALL PERTINENT INFORMATION CONCERNING THE FISH IN A WATERWAY OR WATER IMPOUNDMENT, HAVE EACH STUDENT DEVELOP A HARVEST PLAN WHICH INCLUDES FISHING PRESSURE ALLOWED AND RELATIVE AMOUNTS OF FISH TO BE REMOVED.

8. HAVE EACH STUDENT DEVELOP A WATERSHED MANAGEMENT PLAN FOR A GIVEN WATER IMPOUNDMENT OR WATERWAY WHICH INCLUDES ALL LAND MANAGEMENT FACTORS.

9. DEVELOP A TEST IN WHICH THE STUDENTS WILL IDENTIFY THE MAJOR WEEDS AND ALGAE WHICH OCCUR IN THEIR REGION FROM SPECIMENS, SLIDES, OR PICTURES AND INDICATE THE CONTROL MEASURES THAT ARE USUALLY USED FOR EACH.

10. HAVE EACH STUDENT DEVELOP A FERTILIZATION PLAN FOR A SPECIFIED POND WHICH SHOULD INCLUDE FERTILIZER ANALYSIS, RATES TO APPLY, AND FREQUENCY OF APPLICATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SEINE - 25', 2" MESH
2. SEINE - 10'
3. SECCHI DISC
4. PLANKTON NET
5. WATER TEST KIT
6. MICROSCOPES
7. BOAT - 14'
8. FISH TRAPS
9. CHEMICALS FOR WEED AND ALGAE CONTROL

10. LIFE PRESERVERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. BENNETT, GEORGE. MANAGEMENT OF LAKES AND PONDS. NEW YORK, NEW YORK: VAN NOSTRAND REINHOLD PUBLISHING CORPORATION. 1971, 375 PAGES.

AN EXCELLENT REFERENCE TO ALL ASPECTS OF SMALL IMPOUNDMENT MANAGEMENT.

2. FASSETT, N. A MANUAL OF AQUATIC PLANTS. MADISON, WISCONSIN: THE UNIVERSITY OF WISCONSIN PRESS. 405 PAGES.

THIS REFERENCE CONTAINS KEYS AND ILLUSTRATIONS WHICH ENABLE IDENTIFICATION OF ALL AQUATIC PLANTS.

3. OHIO POND MANAGEMENT. BULLETIN NO. 374. COLUMBUS, OHIO: COOPERATIVE EXTENSION SERVICE, THE OHIO STATE UNIVERSITY. 1973, 16 PAGES.

THIS BULLETIN SERVES AS A GUIDE TO MANAGEMENT OF SMALL WATER IMPOUNDMENTS AND WOULD BE APPLICABLE THROUGHOUT MUCH OF THE NORTH CENTRAL SECTION OF THE COUNTRY.

FISH HATCHERY OPERATION AND MAINTENANCE

UNIT CONCEPT: USE OF APPROPRIATE FISH HATCHERY MANAGEMENT AND MAINTENANCE TECHNIQUES WILL RESULT IN EFFICIENT PRODUCTION OF FISH FOR STOCKING WATER IMPOUNDMENTS AND WATERWAYS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE FISH SPECIES THAT ARE PROPAGATED IN HATCHERIES FOR STOCKING WATERWAYS AND IMPOUNDMENTS IN HIS STATE OR REGION.

2. MAINTAIN AND CLEAN PONDS, RACEWAYS, TROUGHS AND OTHER HATCHERY EQUIPMENT TO AVOID DISEASE, PARASITES, AND PREDATORS.

3. PREPARE AND DISTRIBUTE FOOD TO HATCHERY FISH ACCORDING TO THE PRESCRIBED FORMULATION AND FEEDING PROGRAM.

4. IDENTIFY THE MAJOR STAGES IN THE FISH FOOD CHAIN TO DETERMINE THE NEED FOR ADDITIONS OF FERTILIZERS TO REARING PONDS.

5. USING RECOMMENDED FERTILIZERS AND RATES, FERTILIZE REARING PONDS TO OBTAIN MAXIMUM GROWTH OF THE FISH BEING PRODUCED.

6. STOCK, MANAGE, AND HANDLE BROOD FISH IN SUCH A MANNER THAT MAXIMUM PRODUCTION OF YOUNG WILL RESULT.

7. USING APPROPRIATE HATCHERY TECHNIQUES, MANAGE AND HANDLE EGGS AND FRY TO OBTAIN MAXIMUM SURVIVAL RATE.

8. USING CLIPPERS OR FISH TAGGING PLIERS, MARK FISH SO THAT THE MARK WILL BE RECOGNIZABLE UPON THEIR RECAPTURE.

9. USING TRUCKS WITH NECESSARY OXYGEN AND COOLING EQUIPMENT, TRANSPORT FISH AND STOCK WATER IMPOUNDMENTS WITH LESS THAN 10% MORTALITY RATE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING FISH PRODUCED IN HATCHERIES

A. DETERMINING RECOGNITION CHARACTERISTICS

B. IDENTIFYING THE INTENDED USE

(1) GAME FISH
(2) PAN FISH
(3) BAIT FISH
(4) FORAGE FISH

2. MAINTAINING HATCHERY PONDS AND EQUIPMENT

A. MAINTAINING BROOD PONDS

(1) CLEANING THE PONDS
(2) MAINTAINING PH
(3) AERATING THE PONDS
(4) FERTILIZING THE PONDS
(5) DRAINING THE PONDS

B. MAINTAINING AND CLEANING RACEWAYS

C. MAINTAINING AND CLEANING TROUGHS

D. MAINTAINING AERATING AND PUMPING EQUIPMENT

E. MAINTAINING AND CLEANING FEEDING EQUIPMENT

F. CONTROLLING FISH PARASITES

G. PROTECTING THE PONDS FROM PREDATORS

3. FEEDING BROOD FISH, FRY, AND FINGERLINGS

A. PREPARING THE FOOD

(1) CALCULATING INGREDIENTS
(2) MIXING THE FOOD

B. DISTRIBUTING THE FOOD

4. IDENTIFYING STAGES IN THE FISH FOOD CHAIN

A. NUTRIENTS AND SUNLIGHT

B. PRODUCTION OF BACTERIA AND ALGAE

C. PRODUCTION OF INSECTS, PROTOZOA, CRUSTACEANS

D. PRODUCTION OF FORAGE FISH SPECIES

E. PRODUCTION OF PREDATOR FISH SPECIES

5. FERTILIZING HATCHERY PONDS FOR FISH FOOD PRODUCTION

A. DETERMINING TIME AND FREQUENCY OF APPLICATION

B. IDENTIFYING ANALYSIS AND QUANTITIES TO APPLY

C. APPLYING THE FERTILIZER

6. MANAGING BROOD FISH

A. STOCKING BROOD FISH

(1) SELECTING BREEDERS
(2) DETERMINING TIME OF STOCKING

B. IDENTIFYING SPAWNING METHODS

(1) POND SPAWNING
(2) PEN SPAWNING

C. MAINTAINING SPAWNING CONTAINERS

D. STRIPPING BROOD FISH FOR EGGS AND MILT

7. MANAGING EGGS AND FRY

A. MEASURING AND COUNTING EGGS

B. CONTROLLING DISEASE

C. FEEDING FRY

8. MARKING FINGERLINGS

A. CLIPPING FINS

B. TAGGING

9. TRANSPORTING FISH AND STOCKING WATER IMPOUNDMENTS

A. MAINTAINING OXYGEN CONTENT

B. MAINTAINING APPROPRIATE WATER TEMPERATURE

C. CALCULATING STOCKING RATES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS DEVELOP A BULLETIN BOARD DISPLAY OF THE COMMON FISH SPECIES PRODUCED BY HATCHERIES IN THEIR STATE.

2. AFTER A VISIT TO A FISH HATCHERY, HAVE EACH STUDENT DEVELOP A PLAN FOR MAINTAINING A HATCHERY TO HELP PREVENT DISEASE, PARASITES, AND PREDATORS.

3. VISIT A FISH HATCHERY TO OBSERVE AND/OR ASSIST THE EMPLOYEES IN PREPARING AND DISTRIBUTING FOOD TO THE FISH.

4. USING A PLANKTON NET AND STEREO-MICROSCOPES, HAVE THE STUDENTS COLLECT AND EXAMINE THE DIFFERENT STAGES IN THE FISH FOOD CHAIN.

5. HAVE THE STUDENTS DETERMINE THE FERTILITY OF A WATER IMPOUNDMENT USING A SECCHI DISC.

6. HAVE AN EMPLOYEE OF A FISH HATCHERY DISCUSS WITH THE STUDENTS SPECIAL MANAGEMENT TECHNIQUES USED FOR BROOD FISH.

7. HAVE EACH STUDENT STRIP EGGS AND/OR MILT FROM A BROOD FISH UNDER SUPERVISION OF THE INSTRUCTOR AND A FISH HATCHERY EMPLOYEE.

8. HAVE EACH STUDENT MARK FISH BY FIN CLIPPING OR BY TAGGING.

9. HAVE THE STUDENTS DETERMINE THE NUMBER OF EACH SPECIES OF FISH THAT SHOULD BE STOCKED IN A WATER IMPOUNDMENT OF SPECIFIED SIZE AND FERTILITY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USE SLIDES OF FISH TO EVALUATE THE STUDENTS ON THEIR ABILITY TO IDENTIFY FISH SPECIES COMMONLY FOUND IN FISH HATCHERIES.

2. HAVE A HATCHERY EMPLOYEE ASSIST IN EVALUATION OF THE PLANS DEVELOPED BY THE STUDENTS FOR MAINTAINING A HATCHERY AS INDICATED IN A PREVIOUS ACTIVITY.

3. HAVE THE STUDENTS LIST THE STEPS INVOLVED IN PREPARING AND DISTRIBUTING FOOD FOR FISH IN A SPECIFIC FISH HATCHERY.

4. HAVE EACH STUDENT DIAGRAM THE FISH FOOD CHAIN AND EXPLAIN EACH STAGE WITH COMPLETE ACCURACY.

5. HAVE THE STUDENTS CALCULATE THE AMOUNT, ANALYSIS, AND THE APPROXIMATE FREQUENCY OF APPLICATION OF FERTILIZER TO A REARING POND WHEN GIVEN THE POND SIZE AND FISH SPECIES PRESENT.

6. HAVE EACH STUDENT STRIP A RIPE FISH OF ITS EGGS SO THAT HE CAN BE EVALUATED AS TO CORRECTNESS OF TECHNIQUE.

7. HAVE THE STUDENTS LIST WITH COMPLETE ACCURACY THE STEPS IN CARING FOR EGGS FROM STRIPPING TO HATCHING.

8. HAVE EACH STUDENT CLIP OR TAG A FISH FOR EVALUATION AS TO CORRECTNESS OF TECHNIQUE.

9. GIVE THE STUDENTS A SPECIFIED WATER IMPOUNDMENT TO CALCULATE THE NUMBER, SIZE, SPECIES, AND FREQUENCY OF STOCKING OF FISH THAT WOULD BE REQUIRED TO PRODUCE THE DESIRED RESULTS FROM THE STOCKING.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SECCHI DISC

2. FISH TAGGING PLIERS AND TAGS

3. FIN CLIPPERS

4. PLANKTON NET

5. STEREO-MICROSCOPE

F. EXAMPLES OF SUPPORTING REFERENCES

1. BENNET, GEORGE. MANAGEMENT OF LAKES AND PONDS. NEW YORK, NEW YORK: VAN NOSTRAND REINHOLD PUBLISHING CORPORATION. 1971, 375 PAGES.

THIS BOOK CONTAINS INFORMATION CONCERNING THE STOCKING OF FISH SUCH AS SPECIES TO STOCK, REASONS FOR STOCKING, AND MAINTAINING FISH BALANCE IN ADDITION TO A COMPLETE DISCUSSION OF MANAGEMENT OF WATER IMPOUNDMENTS FOR FISH PRODUCTION.

2. A VISIT TO A FEDERAL FISH HATCHERY. WASHINGTON, D.C.: SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE. 1954, 8 PAGES.

THIS PAMPHLET PROVIDES AN OVERVIEW OF THE OPERATION OF A FEDERAL FISH HATCHERY.

III

FORESTRY

U.S.O.E. CODE 01.06 01 00 00

TREE IDENTIFICATION

ESTABLISHING THE FOREST

TIMBER STAND IMPROVEMENT

FOREST DISEASE, INSECT AND PEST CONTROL

FIRE PREVENTION AND CONTROL

FOREST MENSURATION

CHRISTMAS TREE PRODUCTION

TREE IDENTIFICATION

UNIT CONCEPT: IF THE AGRICULTURAL RESOURCE STUDENT IS ABLE TO ACCURATELY IDENTIFY THE COMMON TREE SPECIES IN HIS AREA, HE WILL HAVE A BASIS FOR PERFORMING MANY OF THE OPERATIONS IN FOREST CONSERVATION OCCUPATIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A GROUP OF ECONOMICALLY IMPORTANT TREES COMMON TO THE AREA, CORRECTLY IDENTIFY EACH BY SCIENTIFIC AND/OR COMMON NAME WITH THE AID OF REFERENCES OR AN IDENTIFICATION KEY.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING TREES

   A. USING LEAF CHARACTERISTICS

      (1) DETERMINING TYPE OF LEAF ARRANGEMENT
      (2) IDENTIFYING TYPE OF MARGIN
      (3) CONSIDERING SIZE AND SHAPE
      (4) CONSIDERING TEXTURE AND COLOR

   B. OBSERVING FLOWERS

   C. OBSERVING TYPE OF FRUIT PRESENT

      (1) IDENTIFYING NUTS
      (2) IDENTIFYING BERRIES
      (3) IDENTIFYING CONES
      (4) IDENTIFYING WINGED FRUIT PODS

   D. USING TWIG CHARACTERISTICS

      (1) IDENTIFYING CHARACTERISTICS OF BUDS AND LEAF SCARS
      (2) CONSIDERING PITH CHARACTERISTICS
      (3) CONSIDERING COLOR

E. USING THE BARK

(1) DETERMINING ROUGHNESS
(2) DETERMINING COLOR

F. USING TASTE AND SMELL

G. OBSERVING TREE GROWTH CHARACTERISTICS

(1) CONSIDERING SHAPE OF CROWN
(2) CONSIDERING PERSISTENCE OF DEAD BRANCHES
(3) BUTTRESSING OR SWELLING OF LOWER TRUNK

H. OBSERVING THE SITE CONDITIONS

(1) CONSIDERING TOPOGRAPHIC FEATURES
(2) CONSIDERING SOIL TYPE, CONDITION AND DRAINAGE
(3) CONSIDERING SURROUNDING VEGETATION

I. IDENTIFYING THE RANGE OR DISTRIBUTION OF TREE SPECIES

(1) CONSIDERING THE SOILS PRESENT
(2) CONSIDERING THE CLIMATE

J. IDENTIFYING HYBRID SPECIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS USE TREE IDENTIFICATION REFERENCES AND TREE KEYS FOR THE STATE OR REGION TO IDENTIFY VARIOUS TREES ON THE SCHOOL LAND LABORATORY BY THEIR COMMON AND SCIENTIFIC NAMES.

B. HAVE EACH STUDENT DEVELOP A NOTEBOOK WITH TREE IDENTIFICATION KEYS, DIAGRAMS AND LEAF, BUD AND TWIG SPECIMENS OF THE ECONOMICALLY IMPORTANT TREES FOUND IN HIS AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PREPARE A PRACTICAL EXAMINATION IN WHICH THE STUDENT IS TO IDENTIFY AT LEAST THIRTY ECONOMICALLY IMPORTANT TREES THAT ARE FOUND IN HIS STATE OR REGION. A FIELD TRIP TO AN ARBORETUM MAY BE NECESSARY TO HAVE A SUFFICIENT NUMBER OF TREES TO USE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. NOTEBOOK

2. LEAVES, BARK, TWIGS, FRUITS FOR TREE IDENTIFICATION. PICTURES, SLIDES, FILMSTRIPS AND OTHER SIMILAR AIDS CAN ALSO BE USED.

3. PLANT KEYS FOR COMMON TREES

F. EXAMPLES OF SUPPORTING REFERENCES

1. ANDERSON, DAVID A. AND SMITH, WILLIAM A. FORESTS AND FORESTRY. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1970, 357 PAGES.

   THIS TEXT WOULD BE OF PARTICULAR VALUE TO TEACHERS AND STUDENTS IN THE SOUTHERN SECTION OF THE UNITED STATES AS THE TREE IDENTIFICATION MATERIAL APPLIES PARTICULARLY TO THAT AREA.

2. DEAN, F. W., CHADWICK, L. C. AND COWEN, W. F. OHIO TREES. CURRENT EDITION. COLUMBUS, OHIO: THE UNIVERSITY BOOKSTORE, THE OHIO STATE UNIVERSITY. 127 PAGES.

   THIS BOOKLET CONTAINS DIAGRAMS AND DISCUSSIONS OF LEAF, TWIG AND BUD CHARACTERISTICS USED IN TREE IDENTIFICATION AS WELL AS KEYS TO DECIDUOUS AND EVERGREEN TREES. IT WOULD BE MOST APPLICABLE IN THE NORTH CENTRAL STATES.

3. HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

   THIS HANDBOOK CONTAINS EXCELLENT DRAWINGS AND DIAGRAMS OF TREE AND LEAF PARTS USED IN TREE IDENTIFICATION.

ESTABLISHING THE FOREST

UNIT CONCEPT: PROPER DEVELOPMENT AND IMPLEMENTATION OF PLANS FOR FOREST ESTABLISHMENT WILL RESULT IN INCREASED PRODUCTION OF TIMBER ALONG WITH NUMEROUS OTHER BENEFITS TO MAN.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND EXPLAIN AT LEAST EIGHT BENEFITS OF FOREST RESOURCES TO MAN.

2. WHEN GIVEN A SITE TO BE ESTABLISHED OR RE-ESTABLISHED AS A FOREST, DEVELOP A REFORESTATION PLAN WHICH SHOULD INCLUDE THE METHOD TO BE USED, THE SEEDBED PREPARATION REQUIRED, THE TREE SPECIES, AND THE SPACING BETWEEN THE TREES.

3. WHEN GIVEN A SITE AND SPECIFIC METHOD OF REFORESTATION, PREPARE THE SEEDBED IN THE PRESCRIBED MANNER.

4. WHEN GIVEN A SITE AND SPECIFIC PLANTING OR SEEDING METHOD, PLANT OR SEED THE TREES WITH LESS THAN 20% LOSS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING BENEFITS OF THE FOREST

   A. IDENTIFYING FOREST USES

   B. DETERMINING FOREST VALUES

      (1) IDENTIFYING CASH PRODUCTS
      (2) DETERMINING AESTHETIC AND RECREATION VALUES

2. DEVELOPING THE REFORESTATION PLAN

   A. SELECTING THE METHOD OF FOREST REPRODUCTION

      (1) IDENTIFYING NATURAL METHODS
      (2) IDENTIFYING ARTIFICIAL METHODS

   B. ANALYZING THE PLANTING OR SEEDING SITE

(1) DETERMINING SOIL FEATURES
(2) DETERMINING PHYSICAL FEATURES
(3) DETERMINING NEEDED SEEDBED PREPARATION
(4) SELECTING TREE SPECIES

(A) IDENTIFYING INTENDED USE
(B) IDENTIFYING SITE CONDITIONS

C. PLANNING FOR PLANTING OR SEEDING

(1) DETERMINING SPACING
(2) DETERMINING STOCKING RATES
(3) DETERMINING DESIRED TYPE OF STAND
(4) SELECTING APPROPRIATE SEASON

3. PREPARING THE SITE FOR PLANTING OR SEEDING

A. USING MECHANICAL MEANS

B. USING CHEMICAL MEANS

C. USING FIRE

D. OPERATING AND MAINTAINING SEEDBED PREPARATION AND PLANTING EQUIPMENT

4. PLANTING OR SEEDING THE SITE

A. OBTAINING AND HANDLING SEEDS AND SEEDLINGS

(1) DETERMINING SOURCES AND COSTS OF SEEDS AND SEEDLINGS
(2) TRANSPORTING SEEDLINGS
(3) HANDLING BEFORE AND DURING PLANTING OR SEEDING

B. PLANTING AND SEEDING TREES

(1) PLANTING SEEDLINGS BY HAND
(2) PLANTING SEEDLINGS BY MACHINE
(3) SEEDING BY HAND BROADCASTING
(4) SEEDING BY MACHINES OR FROM THE AIR

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. SHOW SLIDES, FILMSTRIPS AND FILMS ON FOREST IMPORTANCE AND ESTABLISHMENT.

2. A. RECOMMEND A PLANTING OR SEEDING PLAN FOR AN AREA DESIGNATED FOR FORESTATION.

B. OBSERVE TREE PLANTATIONS EXHIBITING PROPER AND IMPROPER SELECTION OF TREE SPECIES.

3. TAKE FIELD TRIPS TO PLANTING OR SEEDING SITES TO OBSERVE AND/OR ASSIST IN EQUIPMENT OPERATION DURING SEEDBED PREPARATION AND PLANTING.

4. SELECT A SITE ON THE SCHOOL LAND LABORATORY OR ON A COOPERATOR'S LAND FOR AFFORESTATION OR REFORESTATION, SELECT TREES, PREPARE THE SITE, AND PLANT OR SEED THE AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST EIGHT BENEFITS OF THE FOREST TO MAN.

2. ASSIGN THE STUDENTS A LAND AREA TO BE ESTABLISHED OR RE-ESTABLISHED AS A FOREST. HAVE EACH STUDENT DEVELOP A COMPLETE PLAN FOR REFORESTATION WHICH SHOULD INCLUDE THE METHOD TO BE USED, THE SEEDBED PREPARATION THAT WOULD BE NECESSARY, AND PLANTING PROCEDURES. IF NEEDED, A SERVICE FORESTER OR FOREST INDUSTRY REPRESENTATIVE COULD BE USED TO ASSIST IN EVALUATING THE PLANS.

3. HAVE THE CLASS PREPARE A SITE ON THE SCHOOL LAND LABORATORY OR ON A COOPERATOR'S LAND FOR PLANTING OR SEEDING TO TREES. EVALUATE THE GROUP MEMBERS AS TO THEIR EQUIPMENT OPERATION ABILITIES AND THE CONDITION OF THE PREPARED SITE.

4. HAVE THE GROUP PLANT OR SEED THE PREPARED SITE IN THE PRESCRIBED MANNER WITH EACH STUDENT TO BE EVALUATED ON HIS INDIVIDUAL PERFORMANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS

2. CHAIN SAWS

3. BRUSH AXES

4. DIRECT SEEDERS

5. PLANTING BARS

6. PLANTING MATTOCKS

7. CHEMICAL SPRAYER - HAND AND/OR POWER

8. FARM TRACTOR WITH DISC-TYPE HARROW

F. EXAMPLES OF SUPPORTING REFERENCES

1. MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1970, 124 PAGES.

   PROBLEM AREA 3 IN THIS REFERENCE CONTAINS A DISCUSSION OF FOREST REGENERATION FROM PRODUCTION OF TREE SEEDLINGS TO PLANTING AND SEEDING.

2. MANAGING THE FAMILY FOREST. BULLETIN NO. F 2187. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 61 PAGES.

   THIS BULLETIN CONTAINS A CHAPTER ON NATURAL FOREST REGENERATION AND TREE PLANTING. IT WOULD BE VALUABLE FOR STUDENT USE.

TIMBER STAND IMPROVEMENT

UNIT CONCEPT: THE USE OF APPROPRIATE TIMBER STAND IMPROVEMENT PRACTICES, WHEN ECONOMICALLY FEASIBLE, WILL INCREASE THE QUALITY AND VALUE OF STANDING TIMBER.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. PRESCRIBE FOR A SPECIFIC FOREST PRODUCT ON A GIVEN PLANTATION OF ANY AGE THE TIMING, METHOD AND INTENSITY OF THE NEXT WEEDING, THINNING AND PRUNING.

2. WHEN GIVEN A FOREST AREA AND TIMBER STAND IMPROVEMENT PRACTICES TO BE IMPLEMENTED, COMPLETE THE PRESCRIBED PRACTICES WITH COMPETENCE REQUIRED TO OBTAIN THE DESIRED RESULTS.

3. IDENTIFY THE DIFFERENT GOVERNMENT AND PROFESSIONAL FOREST MANAGEMENT ORGANIZATIONS AND EXPLAIN THE SERVICES THEY PROVIDE FOREST LANDOWNERS.

B. INSTRUCTIONAL AREAS

1. SELECTING TIMBER STAND IMPROVEMENT METHODS

   A. ANALYZING THE FOREST

      (1) DETERMINING FOREST CONDITION
      (2) DETERMINING FOREST COMPOSITION
      (3) DETERMINING FOREST AGE AND GROWTH

   B. IDENTIFYING MANAGEMENT GOALS

2. IMPLEMENTING TIMBER STAND IMPROVEMENT PRACTICES

   A. WEEDING A FOREST PLANTATION

      (1) USING MECHANICAL METHODS

         (A) OPERATING THE EQUIPMENT
         (B) MAINTAINING THE EQUIPMENT

      (2) USING CHEMICAL METHODS

(A) SELECTING CHEMICALS
(B) OPERATING EQUIPMENT
(C) MAINTAINING THE EQUIPMENT

B. THINNING A FOREST PLANTATION

(1) DETERMINING THE METHOD OF THINNING

(A) USING THE SELECTION SYSTEM
(B) USING ROW THINNING

(2) OPERATING AND MAINTAINING THE EQUIPMENT

C. MAKING PRE-COMMERCIAL AND SUBSEQUENT THINNINGS

(1) MAKING RELEASE (LIBERATION) CUTTINGS
(2) MAKING IMPROVEMENT CUTTINGS
(3) SELECTING AND APPLYING CHEMICALS
(4) OPERATING AND MAINTAINING EQUIPMENT

D. PRUNING THE FOREST PLANTATION

(1) DETERMINING THE SEASON
(2) DETERMINING THE STAND AGE AND AMOUNT OF PRUNING REQUIRED
(3) OPERATING AND MAINTAINING THE EQUIPMENT

3. IDENTIFYING FOREST MANAGEMENT SERVICES

A. DETERMINING FEDERAL, STATE AND COUNTY GOVERNMENT AGENCIES AND SERVICES

B. DETERMINING PROFESSIONAL AND PRIVATE CONSERVATION ORGANIZATIONS AND SERVICES

C. IDENTIFYING FOREST RESEARCH ORGANIZATIONS AND SERVICES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS RECOMMEND TIMBER STAND IMPROVEMENT PRACTICES ON A GIVEN STAND OF TIMBER AND BE ABLE TO DEFEND THEIR RECOMMENDATIONS.

2. A. TAKE FIELD TRIPS TO PLANTATIONS AND WOODLOTS EXHIBITING USE AND NON-USE OF PROPER TIMBER STAND IMPROVEMENT PRACTICES.

B. HAVE STUDENTS DEMONSTRATE SAFE EQUIPMENT OPERATION BY USING APPROPRIATE TIMBER STAND IMPROVEMENT PRACTICES ON THE SCHOOL FOREST OR ON A COOPERATOR'S WOODLOT.

C. USE AN INCREMENT BORER TO SHOW THE EFFECTS OF TIMBER STAND IMPROVEMENT PRACTICES ON THE GROWTH RATE OF TREES.

3. A. HAVE REPRESENTATIVES OF DIFFERENT FOREST ORGANIZATIONS AS RESOURCE PERSONS TO DISCUSS THEIR PROGRAMS AND SERVICES.

B. TAKE A FIELD TRIP TO A FOREST EXPERIMENT STATION OR RESEARCH LABORATORY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DETERMINE THE TIMBER STAND IMPROVEMENT PRACTICES NEEDED ON A GIVEN WOODLOT OR PLANTATION. HAVE A SERVICE FORESTER OR FOREST INDUSTRY EMPLOYEE ASSIST IN THE EVALUATION OF THE STUDENTS' RECOMMENDATIONS AND INDICATE HIS OBSERVATIONS CONCERNING NEEDED TIMBER STAND IMPROVEMENT.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO OPERATE AND MAINTAIN TOOLS AND EQUIPMENT USED IN TIMBER STAND IMPROVEMENT. THE EVALUATION SHOULD INCLUDE CORRECTNESS OF EQUIPMENT OPERATION AND MAINTENANCE AS WELL AS OBSERVANCE OF SAFETY PRECAUTIONS.

3. HAVE EACH STUDENT LIST SIX FOREST MANAGEMENT ORGANIZATIONS AND DESCRIBE THESERVICES THEY PROVIDE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. CHAIN SAWS
3. TREE INCREMENT BORER
4. PRUNING EQUIPMENT
5. PAINT (MARKING) GUNS
6. TREE INJECTORS
7. CHEMICAL SPRAYERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. MANAGEMENT OF FOREST RESOURCES FOR MULTIPLE USE. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY, 1970, 124 PAGES.

THE STUDENT GUIDE PRESENTS GENERAL INFORMATION CONCERNING TIMBER STAND IMPROVEMENT. THE TEACHER'S GUIDE PROVIDES LEARNING ACTIVITIES AND STUDY QUESTIONS WHICH WOULD BE HELPFUL IN TEACHING THE UNIT.

2. MANAGING THE FAMILY FOREST. BULLETIN NO. F 2187. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 61 PAGES

THIS PAMPHLET GIVES A GENERAL DESCRIPTION OF THE DIFFERENT TIMBER STAND IMPROVEMENT PRACTICES. IT WOULD BE APPROPRIATE FOR STUDENT USE.

FOREST DISEASE, INSECT AND PEST CONTROL

UNIT CONCEPT: EACH YEAR, INSECTS, DISEASES AND OTHER DESTRUCTIVE AGENTS CAUSE LOSSES OF BILLIONS OF BOARD FEET OF TIMBER. TO KEEP THE LOSS OF TIMBER AT A MINIMUM, FOREST MANAGEMENT MUST INCLUDE IDENTIFICATION OF EXISTING AND POTENTIAL PEST PROBLEMS AND EFFECTIVE PREVENTION, TREATMENT AND CONTROL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY FIVE MAJOR TREE DISEASES IN HIS REGION AND DESCRIBE THE SYMPTOMS OF AFFECTED TREES WITH COMPLETE ACCURACY.

2. SELECT THE MOST APPROPRIATE CONTROL MEASURE FOR A GIVEN DISEASE AND SITUATION AND PERFORM THE NECESSARY PREVENTION OR CONTROL PROCEDURES WITH ACCURACY NEEDED TO KEEP DISEASE LOSSES IN THE FOREST AT A MINIMUM.

3. IDENTIFY EIGHT MAJOR TREE INSECTS IN HIS REGION AND DESCRIBE THE DAMAGE THEY CAUSE WITH COMPLETE ACCURACY.

4. SELECT THE MOST APPROPRIATE CONTROL MEASURE FOR A GIVEN INSECT AND SITUATION AND PERFORM THE NECESSARY PREVENTION OR CONTROL PROCEDURES WITH ACCURACY NEEDED TO KEEP INSECT LOSSES IN THE FOREST AT A MINIMUM.

5. DETERMINE THE EFFECTS OF ANIMALS, MAN AND NATURAL PHENOMENA ON THE FOREST AND METHODS OF CONTROLLING THEM.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE MAJOR FOREST DISEASES

   A. IDENTIFYING ROT-CAUSING FUNGI

      (1) CLASSIFYING FUNGI
      (2) IDENTIFYING SYMPTOMS AND SIGNS OF MAJOR FUNGI INFECTION
      (3) IDENTIFYING RUSTS

B. IDENTIFYING FOLIAGE DISEASES

C. IDENTIFYING STEM DISEASES

D. IDENTIFYING ROOT DISEASES

2. DEVELOPING DISEASE PREVENTION AND CONTROL PROGRAMS

A. PREVENTING FOREST DISEASES

B. DETERMINING DISEASE CONTROL METHODS

(1) OPERATING AND ADJUSTING EQUIPMENT
(2) SELECTING AND APPLYING CHEMICALS

C. EVALUATING COSTS AND EFFECTIVENESS

3. DETERMINING THE ROLE OF INSECTS IN THE FOREST

A. DETERMINING IMPORTANCE OF FOREST INSECTS

B. IDENTIFYING BENEFICIAL INSECTS

C. IDENTIFYING DESTRUCTIVE INSECTS

(1) IDENTIFYING CONIFER AND HARDWOOD DEFOLIATORS
(2) IDENTIFYING TIP, CAMBIUM, HEARTWOOD AND ROOT FEEDERS
(3) IDENTIFYING SAP FEEDERS
(4) IDENTIFYING SEED DESTROYERS
(5) IDENTIFYING DISEASE VECTORS

D. IDENTIFYING FOREST INSECT DAMAGE

4. SELECTING INSECT CONTROL MEASURES

A. DETERMINING DIRECT CONTROL METHODS

(1) USING MECHANICAL METHODS

(A) OPERATING TOOLS AND EQUIPMENT
(B) MAINTAINING TOOLS AND EQUIPMENT

(2) USING CHEMICAL METHODS

(A) SELECTING CHEMICALS
(B) MAKING FORMULATIONS
(C) APPLYING CHEMICALS
(D) OPERATING AND MAINTAINING EQUIPMENT
(E) PRACTICING SAFETY WITH CHEMICALS

B. DETERMINING INDIRECT CONTROL METHODS

(1) USING SILVICULTURAL PRACTICES
(2) USING INDIRECT BIOLOGICAL AND CHEMICAL CONTROLS

C. EVALUATING COSTS AND EFFECTIVENESS

D. DETERMINING FOREST INSECT LEGISLATION AND CONTROL REGULATIONS

5. IDENTIFYING OTHER DESTRUCTIVE AGENTS

A. DETERMINING THE EFFECTS OF FOREST ANIMALS

B. DETERMINING THE EFFECTS OF MAN

C. DETERMINING THE EFFECTS OF NATURAL PHENOMENA

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. MAKE FIELD DISSECTIONS OF TREES WITH A CHAIN SAW TO SHOW VISIBLE SIGNS AND SYMPTOMS OF DECAY.

2. HAVE THE STUDENTS DEVELOP A DISEASE PREVENTION PLAN FOR A GIVEN FORESTED AREA.

3. LOCATE, CAPTURE AND IDENTIFY FOREST INSECT PESTS AND PREPARE THEM FOR EXHIBIT.

4. OBSERVE AND/OR ASSIST IN MECHANICALLY OR CHEMICALLY CONTROLLING INSECTS ON A FOREST PLANTATION WHERE SUCH PROCEDURES ARE IN PROGRESS.

5. TAKE FIELD TRIPS TO FOREST PLANTATIONS EXHIBITING PROTECTIVE MEASURES TO PREVENT DAMAGE BY INSECTS, DISEASES, MAN, ANIMALS AND/OR CLIMATIC FACTORS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS IDENTIFY THE MAJOR FOREST DISEASES AND/OR THEIR SYMPTOMS FROM SPECIMENS, SLIDES OR PICTURES.

2. HAVE THE STUDENTS DEVELOP A PLAN TO PREVENT AND CONTROL DISEASES ON A GIVEN FORESTED AREA. EVALUATE THE PLANS AS TO FEASIBILITY AND COMPLETENESS.

3. DEVELOP A PRACTICAL EXAMINATION USING SPECIMENS, SLIDES OR PICTURES OF THE EIGHT MAJOR FOREST INSECTS IN THE REGION. HAVE THE STUDENTS IDENTIFY THE INSECTS AND DESCRIBE THE DAMAGE THEY CAUSE.

4. ON A GIVEN FOREST PLOT WITH INSECT INFESTATION, HAVE THE STUDENTS PERFORM MECHANICAL AND/OR CHEMICAL MEASURES WHICH WILL HELP CONTROL INSECT DAMAGE. EVALUATE THE STUDENT IN RELATION TO THEIR CORRECT USE AND MAINTENANCE OF EQUIPMENT AND USE OF APPROPRIATE PROCEDURES.

5. HAVE THE STUDENTS LIST THE DESTRUCTIVE AGENTS TO A FOREST OTHER THAN INSECTS AND DISEASE AND INDICATE HOW THEIR EFFECTS CAN BE MINIMIZED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. NONPOISONOUS KILLING JARS
3. INSECT NET
4. INSECT SPREADING BOARD
5. INSECT RELAXING BOX
6. INSECT EXHIBIT CASE
7. CHAIN SAWS
8. PRUNING EQUIPMENT
9. CHEMICAL SPRAYERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ALLEN, SHIRLEY W. AND SHARPE, GRANT W. AN INTRODUCTION TO AMERICAN FORESTRY. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1960, 466 PAGES.

   CHAPTERS NINE AND TEN OF THIS TEXT CONSIDER THE MAJOR FOREST INSECTS AND DISEASES AND METHODS OF CONTROL.

2. ANDERSON, R. F. FOREST AND SHADE TREE ENTOMOLOGY. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1960.

   THIS BOOK PROVIDES IDENTIFICATION, SYMPTOMS OF DAMAGE AND CONTROL MEASURES FOR MAJOR FOREST INSECTS.

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3. MANAGING THE FAMILY FOREST. BULLETIN NO. F 2187. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 61 PAGES.

IN THIS BULLETIN, GENERAL INFORMATION IS GIVEN CONCERNING THE MAJOR FOREST INSECTS AND DISEASES WHICH OCCUR IN HARDWOOD AND SOFTWOOD FORESTS.

FIRE PREVENTION AND CONTROL

UNIT CONCEPT: EACH YEAR VALUABLE TIMBER RESOURCES, RECREATIONAL AREAS, AND WILDLIFE HABITATS ARE DESTROYED BY FIRE. THE USE OF PROPER METHODS OF PREVENTING, DETECTING AND SUPPRESSING FOREST FIRES WILL HELP MINIMIZE THESE LOSSES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DETERMINE THE BEHAVIOR OF FIRE BY DEFINING AND DESCRIBING THE TERMS:

   A. FIRE TRIANGLE

   B. RADIATION

   C. CONVECTION

   D. CONDUCTION

   E. IGNITION TEMPERATURE

2. PERFORM FIRE PREVENTION PROCEDURES SUCH AS COMPUTING AND REPORTING THE FIRE DANGER INDEX AND REDUCING FOREST FIRE HAZARDS WITH ACCURACY REQUIRED OF A FORESTRY AIDE.

3. USE THE OSBORN FIRE-FINDER IN A GIVEN SITUATION TO STATE IN DEGREES AND MINUTES THE DIRECTION OF A HYPOTHETICAL "SMOKE" AND TO REPORT SAME TO WITHIN 30 MINUTES USING THE VERNIER SCALE.

4. LOCATE ON A TOPOGRAPHIC MAP, THE POSITION OF A "SMOKE" TO WITHIN 1/4 MILE WHEN GIVEN TWO AZIMUTH READINGS AND TOWER LOCATIONS.

5. WHEN GIVEN A SPECIFIED FIRE CONDITION, IMPLEMENT THE ACTION REQUIRED TO SUPPRESS THE FIRE AND CONTROL IT INCLUDING SAFELY OPERATING FIRE FIGHTING TOOLS AND EQUIPMENT.

6. MAINTAIN FIRE SUPPRESSION TOOLS AND EQUIPMENT WITH COMPETENCY REQUIRED OF A FORESTRY AIDE.

B. INSTRUCTIONAL AREAS

1. DETERMINING FIRE BEHAVIOR

A. IDENTIFYING THE ELEMENTS OF THE FIRE TRIANGLE

(1) DETERMINING THE IMPORTANCE OF FUEL

(A) FUEL SIZE
(B) FUEL ARRANGEMENT
(C) FUEL VOLUME

(2) DETERMINING THE IMPORTANCE OF OXYGEN

(A) EFFECTS OF WIND
(B) EFFECTS OF TEMPERATURE
(C) EFFECTS OF HUMIDITY

(3) DETERMINING THE IMPORTANCE OF HEAT

(A) DETERMINING IGNITION TEMPERATURE
(B) IDENTIFYING SOURCES OF HEAT
(C) IDENTIFYING METHODS OF HEAT TRANSFER - RADIATION, CONVECTION, CONDUCTION

B. DETERMINING THE EFFECTS OF TOPOGRAPHY ON FIRE BEHAVIOR

2. IMPLEMENTING FIRE PREVENTION

A. USING THE FIRE DANGER RATING

(1) IDENTIFYING THE CONDITION OF LESSER VEGETATION
(2) COMPUTING THE BUILD-UP INDEX
(3) COMPUTING THE BURNING INDEX
(4) DETERMINING WIND VELOCITY
(5) DETERMINING FUEL MOISTURE

B. IDENTIFYING HIGH RISK AREAS

(1) DETERMINING MAJOR CAUSES OF FIRE
(2) DETERMINING FREQUENCY OF OCCURRENCES
(3) DETERMINING WHEN, WHERE AND WHY FIRES OCCUR

C. REDUCING FIRE HAZARDS

(1) BUILDING FIRE BREAKS
(2) REDUCING FUEL IN THE AREA
(3) OPERATION AND MAINTENANCE OF TOOLS AND EQUIPMENT

D. USING PROGRAMS AND CAMPAIGNS TO INFLUENCE PEOPLE TOWARD FIRE PREVENTION

3. DEVELOPING PRESUPPRESSION MEASURES

   A. LOCATING SMALL FIRES

      (1) PATROLLING FROM THE AIR
      (2) PATROLLING ON THE GROUND
      (3) READING A TOPOGRAPHICAL MAP
      (4) USING THE HAND COMPASS

   B. USING THE FIRE FINDER

      (1) BECOMING ACQUAINTED WITH THE COUNTRY
      (2) LOCATING AND IDENTIFYING SMOKE

         (A) USING THE SYSTEMATIC SCAN METHOD
         (B) KEEPING TOWER RECORDS

      (3) DETERMINING SMOKE LOCATION

         (A) LEVELING AND CARING FOR THE FIRE FINDER
         (B) ORIENTING THE FIRE FINDER MAP DISC
         (C) MEASURING AND USING ANGLES
         (D) USING THE INTERSECT METHOD OF FIXING
         (E) REPORTING THE SMOKE

   C. USING RADIOS FOR COMMUNICATION

4. DEVELOPING FIRE SUPPRESSION MEASURES

   A. SELECTING THE CONTROL TACTICS

      (1) USING DIRECT CONTROL
      (2) USING INDIRECT CONTROL

   B. ORGANIZING THE LINE CREW

   C. BUILDING THE FIRE LINE

      (1) USING THE ONE-LICK METHOD
      (2) USING THE PROGRESSIVE METHOD
      (3) USING THE ROTARY METHOD

   D. USING THE HAND TOOLS AND EQUIPMENT PROPERLY

   E. EMPLOYING HEAVY EQUIPMENT

   F. APPLYING WATER

   G. USING FIRE RETARDANTS

      (1) SELECTING THE TYPE OF RETARDANT
      (2) SELECTING THE METHOD OF APPLICATION

H. BACK-FIRING

I. PLOWING OUT

5. MAINTAINING TOOLS AND EQUIPMENT

A. REPLACING HANDLES

B. SHARPENING HEADS

C. PREVENTING RUST

D. CARING FOR BACK PACK PUMPS

E. MAINTAINING FIRE HOSE

F. MAINTAINING RADIOS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS DEMONSTRATE THE FACTORS IN THE FIRE TRIANGLE (FUEL, OXYGEN, HEAT) BY COMBINING THEM IN A CONTROLLED SITUATION. FOR EXAMPLE, INSERT A GLOWING WOODEN STICK INTO A TEST TUBE OF OXYGEN.

2. A. TAKE A FIELD TRIP TO A FORESTED AREA AND IDENTIFY NATURAL AND MAN-MADE FIRE RISKS.

   B. SET UP A WEATHER STATION, TAKE READINGS AND COMPUTE THE FIRE DANGER INDEX.

3. TAKE FIELD TRIPS TO LOCAL, STATE AND/OR FEDERAL FORESTS TO OBSERVE THE USE OF FIRE FINDERS TO LOCATE SMOKE OR FIRES.

4. HAVE THE STUDENTS LOCATE A HYPOTHETICAL "SMOKE" ON A TOPOGRAPHICAL MAP OF THE AREA AND LOCATE THE SAME POSITION ON THE GROUND, WHEN GIVEN INFORMATION WHICH WOULD BE AVAILABLE FROM FIRE TOWERS.

5. HAVE PARK MANAGERS, FOREST RANGERS OR FIRE CREW LEADERS DISCUSS FIRE FIGHTING TECHNIQUES AND PROPER EQUIPMENT USE WITH THE STUDENTS.

6. HAVE THE STUDENTS SHARPEN AND REPLACE HANDLES ON FIRE FIGHTING TOOLS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST IN WHICH THE STUDENTS ARE TO MATCH THE TERMS WHICH ARE USED IN DESCRIBING FIRE

BEHAVIOR WITH THEIR DEFINITIONS.

2. HAVE THE STUDENTS COMPUTE THE FIRE DANGER INDEX FOR A SPECIFIED FOREST AREA WHEN GIVEN THE NECESSARY WEATHER AND FOREST DATA.

3. USING A FIRE FINDER, HAVE EACH STUDENT STATE IN DEGREES AND MINUTES THE DIRECTION OF A HYPOTHETICAL "SMOKE" WITHIN 30 MINUTES.

4. GIVE EACH STUDENT A TOPOGRAPHICAL MAP AND AZIMUTH READINGS AND TOWER READINGS OF A NUMBER OF HYPOTHETICAL SMOKE LOCATIONS. HAVE EACH STUDENT DETERMINE THE LOCATIONS ON THE MAP WITH ACCURACY TO WITHIN 1/4 MILE.

5. HAVE THE GROUP OF STUDENTS CONSTRUCT A FIRE LINE BETWEEN TWO POINTS. EVALUATE THE STUDENTS AS TO SPEED, ABILITY TO EFFECTIVELY USE TOOLS AND EQUIPMENT, AND WILLINGNESS TO WORK COOPERATIVELY.

6. HAVE EACH STUDENT SHARPEN OR REPLACE A HANDLE ON A FIRE SUPPRESSION TOOL SUCH AS AN AX, SHOVEL, PULASKI OR RAKE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. CHAIN SAWS
3. BACK PACK PUMPS
4. SHOVELS
5. FIRE RAKES
6. FIRE SWATTERS
7. AXES

F. EXAMPLES OF SUPPORTING REFERENCES

1. BROWN, ARTHUR A. AND DAVIS, KENNETH P. FOREST FIRE: CONTROL AND USE. NEW YORK, NEW YORK: MCGRAW-HILL BOOK COMPANY. 1973, 686 PAGES.

   THIS REFERENCE GIVES A COMPLETE DISCUSSION OF FOREST FIRE PREVENTION, PRE-SUPPRESSION AND SUPPRESSION PROCEDURES.

FOREST MENSURATION

UNIT CONCEPT: ACCURATE MEASUREMENT OF THE PRESENT VOLUME AND GROWTH RATE OF INDIVIDUAL TREES AND STANDS WILL RESULT IN VALUABLE INFORMATION FOR FOREST HARVESTING AND MANAGEMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USE ONE OR MORE OF THE FOLLOWING MEASURES OF FOREST PRODUCTS TO DETERMINE THE VOLUME OF WOOD IN A SPECIFIED NUMBER OF LOGS OR BOLTS WITH ACCURACY REQUIRED OF A FORESTRY AIDE:

   A. LINEAR MEASUREMENT

   B. CORDWOOD MEASUREMENT

   C. CUBIC FOOT MEASUREMENT

   D. BOARD FOOT

   E. WEIGHT

2. USING COMMON TREE MEASUREMENT INSTRUMENTS AND TREE VOLUME TABLES, DETERMINE THE VOLUME OF TIMBER IN A STANDING TREE WITHIN ± 3%.

3. USING TREE IDENTIFICATION KEYS AND AN INCREMENT BORER OR INCREMENT HAMMER, DETERMINE THE SPECIES, AGE AND/OR HISTORY OF A STANDING TREE WITH ACCURACY REQUIRED OF A FORESTRY AIDE.

4. WHEN GIVEN COMMONLY USED SURVEYING INSTRUMENTS, LOCATE AND ESTABLISH FOREST BOUNDARIES AND SAMPLE PLOTS WITH ACCURACY NEEDED TO PERFORM A TIMBER CRUISE.

5. IDENTIFY AND IMPLEMENT THE DIFFERENT METHODS OF CRUISING TIMBER WITH COMPETENCE REQUIRED OF A FORESTRY AIDE.

6. USING STATE OR REGIONAL PRICE DATA, ESTIMATE THE VALUE OF A GIVEN STAND OF TIMBER WITHIN ± 10%.

7. USING A SPRAYER OR BRUSH AND BUCKET, MARK TREES FOR HARVESTING USING MARKING TECHNIQUES ACCEPTED IN THE STATE OR REGION.

B. INSTRUCTIONAL AREAS

1. MEASURING FOREST PRODUCTS

   A. USING BOARD FEET

      (1) DETERMINING SITUATIONS IN WHICH IT IS USED
      (2) USING FORMULAS TO CALCULATE BOARD FEET

   B. USING CUBIC FEET

      (1) DETERMINING CIRCUMSTANCES OF USE
      (2) CALCULATING CUBIC FEET

   C. USING THE CORD

      (1) IDENTIFYING DIFFERENT TYPES OF CORD MEASUREMENT

         (A) STANDARD
         (B) SHORT
         (C) LONG

      (2) DETERMINING CIRCUMSTANCES OF USE
      (3) CALCULATING CORDS

   D. USING UNIT OR PIECE MEASURE

   E. USING WEIGHT MEASURE

2. DETERMINING THE VOLUME OF TIMBER IN A STANDING TREE

   A. DETERMINING THE DIAMETER BREAST HEIGHT (DBH)

   B. DETERMINING THE NUMBER OF LOGS

   C. OBSERVING TREE DEFECTS OR DAMAGE

   D. USING TREE VOLUME TABLES

      (1) DOYLE
      (2) INTERNATIONAL
      (3) OTHER

3. DETERMINING THE SPECIES, HISTORY AND/OR AGE OF A TREE

   A. IDENTIFYING TREE SPECIES

   B. INTERPRETING ANNUAL RINGS

C. USING THE INCREMENT BORER OR HAMMER

4. ESTABLISHING FOREST BOUNDARIES AND LOCATION OF SAMPLE PLOTS

A. IDENTIFYING CHARACTERISTICS OF METES AND BOUNDS AND RECTANGULAR SURVEY SYSTEMS

B. OPERATING FOREST SURVEYING EQUIPMENT

(1) STAFF COMPASS OR TRANSIT AND ROD
(2) CHAIN AND CHAINING PINS
(3) ABNEY HAND LEVEL

C. INTERPRETING MAPS AND AERIAL PHOTOGRAPHS

5. CRUISING TIMBER

A. IMPLEMENTING THE DIFFERENT METHODS OF CRUISING TIMBER

(1) MAKING A 100% OR TOTAL CRUISE
(2) USING THE RANDOM SAMPLE METHOD
(3) USING MECHANICAL SAMPLING METHODS

(A) LINE-PLOT CRUISING
(B) STRIP CRUISING

(4) USING THE VARIABLE PLOT METHOD

(A) USING A WEDGE PRISM
(B) COMPUTING THE BASAL AREA IN SQUARE FEET PER ACRE

B. MAKING A CONTINUOUS FOREST INVENTORY

(1) LOCATING THE SAMPLE PLOT
(2) COLLECTING DATA

6. ESTIMATING THE TIMBER VALUE OF A FOREST AREA

A. READING TIMBER PRICE DATA

B. CALCULATING TIMBER VALUE

7. MARKING TREES FOR HARVESTING

A. USING CORRECT SYMBOLS

B. SELECTING TREES FOR MARKING

C. OPERATING AND MAINTAINING THE EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. GIVE THE STUDENTS MEASUREMENTS OF STANDING TREES, LOGS OR BOARDS AND HAVE THEM CALCULATE THE BOARD FEET, CUBIC FEET AND/OR LINEAR FEET IN THE MATERIAL.

2. ASSIGN THE STUDENTS A NUMBER OF TREES OR A PLOT IN A FORESTED AREA TO PRACTICE DETERMINING THE VOLUME OF WOOD PRESENT.

3. HAVE THE SERVICE FORESTER OR A FOREST INDUSTRY REPRESENTATIVE ASSIST THE STUDENTS IN IDENTIFYING TREE SPECIES, USING THE INCREMENT BORER AND INTERPRETING CORES TAKEN FROM TREES.

4. TAKE A FIELD TRIP TO A FORESTED AREA THAT IS BEING SURVEYED TO ESTABLISH LEGAL FOREST BOUNDARIES AND/OR TO LOCATE SAMPLE PLOTS FOR CRUISING. HAVE THE STUDENTS OBSERVE THE PROCEDURES AND ASSIST, IF POSSIBLE.

5. HAVE THE STUDENTS PERFORM A TOTAL CRUISE ON A GIVEN FOREST PLOT TO DEVELOP ABILITIES IN IDENTIFYING TREES, DETERMINING TREE VOLUMES AND READING VOLUME TABLES.

6. FROM THE CRUISE MADE IN LEARNING ACTIVITY 5, HAVE THE STUDENTS COMPUTE THE VALUE OF THE TIMBER USING REGIONAL PRICE DATA.

7. USE THE SERVICE FORESTER AS A RESOURCE PERSON TO DEMONSTRATE THE PROPER METHODS AND SYMBOLS TO USE IN MARKING TREES FOR HARVESTING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE THE STUDENTS MEASUREMENTS OF STANDING TREES, LOGS OR BOARDS TO CALCULATE THE VOLUME IN BOARD FEET OR CUBIC FEET.

2. ASSIGN THE STUDENTS 10 TO 15 TREES TO DETERMINE THE VOLUME, USING A CRUISER STICK AND TREE VOLUME TABLES. THE STUDENT SHOULD BE ACCURATE WITHIN ± 10%.

3. HAVE THE STUDENTS INTERPRET THE RINGS FROM A CORE TAKEN FROM A TREE WITH AN INCREMENT BORER. THE STUDENTS SHOULD INDICATE THE TREE'S AGE AND ANY MAJOR HISTORICAL FEATURES THAT COULD BE OBSERVED ON THE CORE.

4. DIVIDE THE STUDENTS IN PAIRS. HAVE EACH PAIR OF STUDENTS ESTABLISH THE BOUNDARIES OF A SAMPLE PLOT IN A FORESTED AREA USING THE NECESSARY SURVEYING EQUIPMENT. EVALUATE

THE STUDENTS ON ACCURACY AND CORRECTNESS OF PROCEDURE. OBTAIN AID IN EVALUATION FROM A SERVICE FORESTER, FOREST INDUSTRY REPRESENTATIVE OR SOIL CONSERVATION SERVICE REPRESENTATIVE, IF NECESSARY.

5. HAVE THE CLASS CRUISE A FORESTED AREA USING ONE OF THE BASIC METHODS. EVALUATE EACH STUDENT ON HIS CORRECTNESS OF PROCEDURE, ACCURACY AND [illegible] THE ACCURACY OF THE CRUISE CAN BE CHE[illegible]AREA HAS RECENTLY BEEN OFFICIALLY CRUISE[illegible]

6. HAVE EACH STUDENT CALCULATE THE TO[illegible]LUE OF A FORESTED AREA WHEN GIVEN THE RESULTS OF A TIMBER CRUISE AND REGIONAL PRICE DATA.

7. HAVE EACH STUDENT LIST THE DIFFERENT MARKS OR SYMBOLS USED FOR MARKING TREES AND EXPLAIN THEIR MEANINGS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS
2. CRUISER STICKS
3. STAFF COMPASS OR TRANSIT AND ROD
4. ABNEY LEVEL
5. STEEL TAPE AND CHAINING PINS
6. INCREMENT BORER AND/OR HAMMER
7. TIMBER VOLUME TABLES
8. REGIONAL TIMBER PRICE DATA
9. TREE IDENTIFICATION KEYS
10. TALLY SHEETS
11. PAINT SPRAYER OR BUCKET AND BRUSH
12. TREE DIAMETER TAPES AND/OR CALIPERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ALLEN, SHIRLEY W. AND SHARPE, GRANT W. AN INTRODUCTION TO AMERICAN FORESTRY. NEW YORK, NEW YORK: MCGRAW-HILL BOOK COMPANY. 1960, 466 PAGES.

CHAPTER ELEVEN OF THIS TEXT CONTAINS AN OVERVIEW OF THE ENTIRE PROCESS OF FOREST MENSURATION.

2. HARVESTING FORESTRY PRODUCTS. KIRBYVILLE, TEXAS: VOCATIONAL INSTRUCTIONAL SERVICES, TEXAS STATE DEPARTMENT OF EDUCATION. 1971, 200 PAGES.

   THIS TEACHER'S GUIDE CONTAINS USEFUL TRANSPARENCIES AND INFORMATION CONCERNING FOREST MENSURATION. IT ALSO INCLUDES SOME SUGGESTED REFERENCES.

CHRISTMAS TREE PRODUCTION

UNIT CONCEPT: THE ANNUAL DEMAND FOR CHRISTMAS TREES HAS CREATED MUCH INTEREST IN THEM AS A PRIMARY OR SECONDARY AGRICULTURAL RESOURCE ENTERPRISE. COMPETENT SITE SELECTION, PLANTING, CULTURE, HARVESTING AND MARKETING WILL RESULT IN PRODUCTION OF HIGHER QUALITY TREES AND OFTEN HIGHER NET RETURNS FROM THE ENTERPRISE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. EVALUATE THE MARKET POTENTIAL AND ECONOMICS OF CHRISTMAS TREE PRODUCTION IN HIS AREA.

2. SELECT APPROPRIATE SITES FOR CHRISTMAS TREE PRODUCTION CONSIDERING SOIL REQUIREMENTS, TOPOGRAPHY AND PREPARATION REQUIREMENTS.

3. LAY OUT A CHRISTMAS TREE PLANTATION IN A MANNER WHICH WILL FACILITATE MANAGEMENT.

4. IDENTIFY THE DIFFERENT SPECIES OF CHRISTMAS TREES IN HIS REGION AND INDICATE THEIR CHARACTERISTICS AND MARKET POTENTIAL.

5. USING NEEDED SITE PREPARATION AND PLANTING TOOLS AND EQUIPMENT, PREPARE A SITE AND PLANT CHRISTMAS TREE SEEDLINGS WITH AN ACCEPTABLE SURVIVAL RATE FOR HIS AREA.

6. DEVELOP AND IMPLEMENT A CULTURAL PLAN FOR A CHRISTMAS TREE PLANTATION WHICH WILL RESULT IN VIGOROUS, WELL-FORMED TREES.

7. DEVELOP AND IMPLEMENT A PROTECTION PLAN FOR A CHRISTMAS TREE PLANTATION TO INCLUDE FIRE PROTECTION, PROTECTION FROM INSECTS AND DISEASES, AND PROTECTION FROM ANIMALS.

8. DEVELOP AND IMPLEMENT A HARVESTING PLAN FOR A CHRISTMAS TREE PLANTATION INCLUDING TIMING, EQUIPMENT AND STORAGE.

9. DEVELOP AND IMPLEMENT A MARKETING PLAN FOR A CHRISTMAS TREE ENTERPRISE INCLUDING DEVELOPING OUTLETS, MAKING SALES CONTACTS AND GRADING.

B. INSTRUCTIONAL AREAS

1. EVALUATING THE MARKET POTENTIAL AND ECONOMICS

   A. LOCATING MARKETS

   B. DEVELOPING A BUDGET

      (1) ESTIMATING COSTS
      (2) ESTIMATING RETURNS
      (3) DETERMINING GROSS AND NET RETURNS
      (4) DETERMINING POTENTIAL INCOME/ACRE/YEAR

2. SELECTING SITES FOR CHRISTMAS TREE PRODUCTION

   A. DETERMINING SOIL REQUIREMENTS

   B. DETERMINING ACCEPTABLE TOPOGRAPHY

   C. IDENTIFYING DRAINAGE REQUIREMENTS

3. LAYING OUT THE PLANTATION

   A. DEVELOPING ACCESSIBILITY BY MAKING ROADS AND LANES

   B. DETERMINING ROW AND TREE SPACING

   C. SELECTING THE DIRECTION OF ROWS

   D. PREVENTING TREE BORDER SHADING

4. SELECTING TREE SPECIES

   A. DETERMINING CHARACTERISTICS OF DESIRABLE TREES

   B. DETERMINING MARKET PREFERENCES

   C. IDENTIFYING CHRISTMAS TREES

5. PLANTING TREES

   A. PROVIDING NEEDED SITE PREPARATION

      (1) USING HEAVY EQUIPMENT
      (2) USING HAND TOOLS
      (3) USING CHEMICALS

B. OBTAINING AND SELECTING PLANTING STOCK

C. CARING FOR PLANTING STOCK

D. PLANTING METHODS

(1) USING HAND METHODS
(2) USING PLANTING MACHINES

6. IMPLEMENTING A CULTURAL PLAN FOR CHRISTMAS TREES

A. CONTROLLING COMPETING VEGETATION

(1) OPERATING TOOLS AND EQUIPMENT
(2) MAINTAINING TOOLS AND EQUIPMENT
(3) SELECTING CHEMICALS
(4) FORMULATING CHEMICALS
(5) APPLYING CHEMICALS
(6) USING DOMESTIC ANIMALS
(7) TIMING CONTROL METHODS

B. DETERMINING CULTURAL NEEDS

(1) SHEARING TREES

(A) TIMING
(B) SHEARING TECHNIQUES
(C) OPERATING SHEARING TOOLS
(D) MAINTAINING SHEARING TOOLS
(E) DEBUDDING TREES

(2) USING COLORANT SPRAYS

(1) SELECTING SPRAYS
(2) TIMING APPLICATIONS

7. PROTECTING THE TREE PLANTATION

A. DEVELOPING FIRE PROTECTION AND FIRE SUPPRESSION PROCEDURES

(1) SELECTING SUPPRESSION EQUIPMENT
(2) SAFELY OPERATING SUPPRESSION EQUIPMENT
(3) MAINTAINING SUPPRESSION EQUIPMENT

B. DEVELOPING THE INSECT PREVENTION AND CONTROL PROGRAM

(1) IDENTIFYING INSECT PESTS AND THEIR DAMAGE
(2) USING MECHANICAL CONTROL METHODS
(3) USING CHEMICAL CONTROL METHODS

(A) SELECTING CHEMICALS
(B) FORMULATING CHEMICALS
(C) APPLYING CHEMICALS

C. DEVELOPING THE DISEASE PREVENTION AND CONTROL PROGRAM

(1) IDENTIFYING DISEASE SYMPTOMS
(2) USING MECHANICAL CONTROL METHODS
(3) USING CHEMICAL CONTROL METHODS

D. CONTROLLING DAMAGE FROM DOMESTIC AND WILD ANIMALS

8. HARVESTING

A. TIMING

B. SELECTING EQUIPMENT

C. OPERATING EQUIPMENT

D. MAINTAINING EQUIPMENT

E. ORGANIZING THE CREW

F. TYING OR BALING TREES

9. MARKETING CHRISTMAS TREES

A. SELECTING OUTLETS

B. GRADING AND LABELING TREES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. DEVELOP A BUDGET FOR A CHRISTMAS TREE ENTERPRISE ON A DESIGNATED SITE AFTER OBTAINING COST/RETURN DATA FROM SUCCESSFUL ENTERPRISES.

2. TAKE FIELD TRIPS TO POTENTIAL PLANTATION SITES AND EVALUATE THEM.

3. A. HAVE SUCCESSFUL CHRISTMAS TREE ENTERPRISE OPERATORS AS RESOURCE PERSONS TO DISCUSS METHODS OF LAYING OUT PLANTATIONS TO FACILITATE MANAGEMENT.

B. FOR A GIVEN SITE, DEVELOP A PLANTATION LAYOUT CONSIDERING ACCESSIBILITY, SPACING, ROW DIRECTION AND SHADING.

4. TAKE FIELD TRIPS FOR CONIFER IDENTIFICATION.

5. A. VISIT A NURSERY TO OBSERVE PLANTING STOCK PRODUCTION AND SEEDLING CHARACTERISTICS.

   B. SELECT A SITE, PLANT AND MANAGE A SMALL NUMBER OF CHRISTMAS TREES FOR PERSONAL USE.

6. SELECT CHEMICALS AND DETERMINE FORMULATIONS FOR A GIVEN INSECT OR DISEASE PROBLEM AND SITUATION.

7. HAVE THE STUDENTS DEVELOP AN EXHIBIT OR BULLETIN BOARD DISPLAY OF SPECIMENS OR PICTURES OF IMPORTANT CHRISTMAS TREE DAMAGING INSECTS.

8. ASSIST A CHRISTMAS TREE ENTERPRISE OPERATOR IN HARVESTING HIS TREES.

9. TAKE A FIELD TRIP TO A CHRISTMAS TREE PLANTATION AND HAVE THE OWNER OR AN EMPLOYEE INDICATE EXAMPLES OF EACH GRADE OF TREE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT MAKE A BUDGET FOR A CHRISTMAS TREE ENTERPRISE ON A GIVEN SITE.

2. HAVE EACH STUDENT DETERMINE THE FEASIBILITY OF A DESIGNATED SITE FOR A CHRISTMAS TREE PLANTATION BY DETERMINING SOIL CHARACTERISTICS, TOPOGRAPHY AND ANY OTHER PERTINENT DATA.

3. HAVE EACH STUDENT LAY OUT A CHRISTMAS TREE PLANTATION ON A DESIGNATED SITE. THE PLANS SHOULD CONSIDER ALL PERTINENT FACTORS ABOUT THE SITE AND PROMOTE EASE OF MANAGEMENT.

4. DEVELOP A PRACTICAL EXAMINATION USING BRANCHES, PICTURES OR LIVE SPECIMENS IN WHICH THE STUDENT MUST IDENTIFY THE DIFFERENT SPECIES OF CHRISTMAS TREES IMPORTANT TO HIS AREA.

5. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO PLANT CHRISTMAS TREES FOR EVALUATION AS TO CORRECTNESS OF PROCEDURE.

6. HAVE EACH STUDENT SHEAR A CHRISTMAS TREE FOR EVALUATION AS TO CORRECTNESS OF PROCEDURE AND OBSERVANCE OF SAFETY PRACTICES.

7. HAVE THE STUDENTS IDENTIFY SPECIMENS OF INSECTS, INDICATE THE DAMAGE CAUSED TO TREES, AND RECOMMEND AN APPROPRIATE CONTROL PROGRAM FOR EACH.

8. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO CUT, TRIM AND BALE A CHRISTMAS TREE.

9. DEVELOP A PRACTICAL EXAMINATION IN WHICH THE STUDENT WILL GRADE 10-15 CHRISTMAS TREES USING U.S. STANDARD CHRISTMAS TREE GRADES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HARD HATS

2. SHEARING KNIVES AND LEG PROTECTORS

3. CHEMICAL SPRAYERS

4. FIRE FIGHTING EQUIPMENT

5. AXE

6. BOW SAW

F. EXAMPLES OF SUPPORTING REFERENCES

1. CHRISTMAS TREE CULTURE IN KENTUCKY. BULLETIN NO. 346. LEXINGTON, KENTUCKY: AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF KENTUCKY. 1967, 38 PAGES.

   THIS BULLETIN CONTAINS A COMPLETE DESCRIPTION OF THE CHRISTMAS TREE INDUSTRY FROM SITE SELECTION TO MARKETING.

IV

MINING AREA RESTORATION
U.S.O.E. CODE 01.06 99 00 00

MINING AND RECLAMATION TERMS, METHODS AND LAWS

MINED LAND STABILIZATION AND RECLAMATION

MINING AND RECLAMATION TERMS, METHODS AND LAWS

UNIT CONCEPT: A WORKING KNOWLEDGE OF MINING TERMS, METHODS AND LAWS, AS THEY PERTAIN TO MINED LAND RESTORATION, WILL FACILITATE PLANNING AND EASE OF OPERATION IN RESTORING SURFACE OR UNDERGROUND MINED LAND.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. CATEGORIZE THE MAJOR MINERALS FOUND IN HIS REGION AS ENERGY FUELS, IRON ALLOYS, NON-FERROUS METALS, CONSTRUCTION MINERALS OR CHEMICAL AND INDUSTRIAL MINERALS AND INDICATE THEIR EFFECTS ON RESTORATION.

2. DEFINE THE MAJOR MINING TERMS USED IN MINING AND MINE AREA RESTORATION WITH COMPLETE ACCURACY.

3. THROUGH RESEARCH AND OBSERVATION, IDENTIFY THE MINING METHODS USED IN HIS REGION AS THEY PERTAIN TO MINE AREA RESTORATION.

4. USING LOCAL, STATE AND FEDERAL CODES, DETERMINE THE MAIN PROVISIONS OF THE MINING LAWS IN HIS REGION CONCERNING MINING AND MINE AREA RESTORATION WITH COMPETENCY REQUIRED TO IDENTIFY THE RESTORATION WORK NEEDED ON A SPECIFIED MINED LAND AREA.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING MINERALS AS THEY AFFECT LAND RESTORATION

   A. IDENTIFYING PHYSICAL CHARACTERISTICS OF MINERALS

      (1) FORM
      (2) CLEAVAGE AND FRACTURE
      (3) COLOR
      (4) STREAK
      (5) LUSTER
      (6) HARDNESS
      (7) SPECIFIC GRAVITY

   B. IDENTIFYING THE CHEMICAL COMPOSITION OF MINERALS

C. CATEGORIZING MINERALS

(1) ENERGY FUELS
(2) IRON AND IRON ALLOYS
(3) NONFERROUS METALS
(4) CONSTRUCTION MINERALS
(5) CHEMICAL AND INDUSTRIAL MINERALS

2. DEFINING MINING AND MINE AREA RESTORATION TERMS

A. DEFINING SHAFT MINING TERMS

B. DEFINING SURFACE MINING TERMS

C. DEFINING MINE RESTORATION TERMS

3. DETERMINING METHODS OF MINING AND THEIR INFLUENCE ON RESTORATION EFFORTS

A. IDENTIFYING SURFACE MINING METHODS AND EFFECTS

B. IDENTIFYING UNDERGROUND MINING METHODS AND EFFECTS

(1) CONSTRUCTION OF TUNNELS AND SHAFTS
(2) CONSTRUCTION OF MINE HAULAGEWAYS

4. DETERMINING MINING AND MINE AREA RESTORATION LAWS

A. IDENTIFYING CLAIM LAWS

B. IDENTIFYING LAWS PERTAINING TO MINERAL RIGHTS

C. DETERMINING STATE AND FEDERAL LAWS PERTAINING TO SURFACE AND UNDERGROUND MINING

(1) FEDERAL LAWS FOR GOVERNMENT LANDS AND INDIAN LANDS
(2) STATE LAWS FOR STATE, COUNTY OR MUNICIPALLY-OWNED LANDS
(3) STATE LAWS FOR PRIVATE LANDS

D. IDENTIFYING LOCAL CONTROLS OF MINING ON PRIVATE LANDS

E. IDENTIFYING WATER POLLUTION CONTROLS

F. IDENTIFYING RECLAMATION REGULATIONS

(1) LAKES CREATED
(2) TYPE OF MATERIAL IN OVERBURDEN
(3) USE BEING MADE OF ADJOINING LANDS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. MAKE A COLLECTION OF ROCKS, MINERALS AND PETROLEUM PRODUCTS AND CATEGORIZE THEM AS TO THEIR USE AND IMPORTANCE IN RESTORATION.

2. HAVE THE STUDENTS DEVELOP A LIST OF TERMS USED IN UNDERGROUND MINING, SURFACE MINING, AND MINE AREA RESTORATION AND DEVELOP A WORKING DEFINITION FOR EACH TERM THROUGH FIELD TRIPS, TALKING WITH MINERS OR RECLAMATION WORKERS OR RESEARCH.

3. A. TAKE FIELD TRIPS TO OBSERVE DIFFERENT TYPES OF MINES, MINING OPERATIONS AND RECLAMATION PRACTICES.

   B. MAKE SOIL AND WATER TESTS TO DETERMINE THE EFFECTS OF MINERALS AND OTHER MINE RESIDUES ON SOILS AND WATER.

4. A. STUDY LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS CONCERNING MINING AND MINE AREA RESTORATION.

   B. HAVE RESOURCE PERSONS SUCH AS MINE OPERATORS AND ATTORNEYS DISCUSS MINING OPERATIONS AND LAWS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A PRACTICAL EXAMINATION IN WHICH THE STUDENT WILL IDENTIFY SPECIMENS OF TEN MINERALS COMMON TO HIS STATE OR REGION.

2. IN A MATCHING TEST, THE STUDENT WILL MATCH ALL IMPORTANT MINING AND MINE AREA RESTORATION TERMS WITH THEIR APPROPRIATE DEFINITIONS.

3. HAVE THE STUDENTS LIST THE MAJOR LOCAL, STATE AND FEDERAL LAWS FOR MINE AREA RESTORATION AND INDICATE WHERE THESE LAWS MAY BE FOUND.

4. HAVE THE STUDENTS DESCRIBE IN ESSAY FORM THE DIFFERENT MINING METHODS AND OPERATIONS IN HIS REGION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HAND LENSES

2. GEOLOGISTS' PICKS

3. EXHIBIT CASES FOR ROCKS, MINERALS AND PETROLEUM PRODUCTS

4. SOIL TEST KIT

5. WATER TEST KIT

F. EXAMPLES OF SUPPORTING REFERENCES

1. GALLANT, R. A. AND SCHUBERTH, C. J. DISCOVERING ROCKS AND MINERALS. GARDEN CITY, NEW YORK: THE NATURE HISTORY PRESS. 1967.

   THIS REFERENCE PROVIDES GUIDELINES FOR IDENTIFICATION OF MAJOR ROCKS AND MINERALS.

2. LEWIS, R. S. AND CLARK, G. B. ELEMENTS OF MINING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1967.

   THIS BOOK WILL GIVE THE STUDENT AN INSIGHT INTO THE VARIOUS ASPECTS OF THE MINING INDUSTRY WHICH WOULD BE VALUABLE IN DEFINING TERMS AND UNDERSTANDING RESTORATION PROBLEMS.

3. MATERIALS FROM THE NATIONAL COAL ASSOCIATION, WASHINGTON, D.C.

MINED LAND STABILIZATION AND RECLAMATION

UNIT CONCEPT: IN MANY AREAS, SURFACE AND UNDERGROUND MINING AND ITS EFFECTS HAVE DEVASTATED THE LAND. THIS DEVASTATION CAN BE REMEDIED TO SOME EXTENT THROUGH COMPETENT LAND STABILIZATION AND RECLAMATION EFFORTS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE EFFECTS OF SURFACE AND UNDERGROUND MINING ON THE LAND, VEGETATION, WATER AND WILDLIFE.
2. ANALYZE AND INVENTORY A SURFACE OR UNDERGROUND MINED AREA TO DETERMINE THE ALTERNATIVE LAND USES WHICH MAY BE FEASIBLE ON THE SITE.
3. USING NECESSARY TOOLS AND EQUIPMENT, IMPLEMENT THE STEPS IN BASIC RECLAMATION OF AN AREA FOR A GIVEN LAND USE.
4. SAFELY OPERATE AND MAINTAIN THE TOOLS AND EQUIPMENT USED IN MINED LAND RESTORATION ACCORDING TO THE OPERATORS' MANUALS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE EFFECTS OF MINING
   - A. IDENTIFYING CHANGES IN TOPOGRAPHY
   - B. IDENTIFYING EFFECTS OF EROSION
   - C. DETERMINING EFFECTS ON PLANT LIFE
   - D. DETERMINING EFFECTS ON WATER
   - E. DETERMINING EFFECTS ON WILDLIFE
2. ANALYZING THE MINED SITE
   - A. ANALYZING THE SOIL

B. MAKING WATER TESTS

C. DETERMINING EROSION PROBLEMS

D. IDENTIFYING WATER FEATURES

(1) LAKES AND PONDS
(2) STREAMS
(3) STREAM FLOW

E. IDENTIFYING TOPOGRAPHICAL FEATURES

3. SELECTING ALTERNATIVE USES FOR MINED LAND

A. IDENTIFYING AGRICULTURAL USES

B. DETERMINING FOREST OR RANGE LAND USES

C. DETERMINING RECREATIONAL USES

D. IDENTIFYING GOALS OF THE LAND OWNER AND COMMUNITY

4. IDENTIFYING THE STEPS IN BASIC RECLAMATION

A. PERFORMING ROUGH GRADING

B. PLANTING THE AREA TO TREES, GRASS OR CROPS

C. CONTROLLING DRAINAGE

(1) CONSTRUCTING DIVERSION DITCHES
(2) CONTROLLING ACIDITY
(3) CONSTRUCTING AND/OR OPERATING MINE DRAINAGE TREATMENT FACILITIES

D. REPAIRING SLIDE DAMAGE

E. REPAIRING HAUL ROADS

F. REPAIRING STREAM CHANNELS

G. STABILIZING PONDS

H. CONTROLLING HAZARDOUS CONDITIONS

I. IMPLEMENTING THE SELECTED LAND USE SYSTEM

J. OPERATING AND MAINTAINING RECLAMATION TOOLS AND EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USE FIELD TRIPS, MOVIES AND SLIDES TO OBSERVE DIFFERENT STRIP MINING OPERATIONS, EFFECTS AND RECLAMATION PRACTICES.

2. TEST MINE DRAINAGE WATERS FOR ACIDITY AND MINERAL CONTENT.

3. HAVE MINING FIRM OPERATORS OR EMPLOYEES EXPLAIN THEIR COMPANIES' LAND RECLAMATION EFFORTS.

4. COOPERATE WITH A MINING FIRM TO ASSIST IN RECLAIMING AN AREA INCLUDING OPERATING THE RECLAMATION EQUIPMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS DESCRIBE IN WRITING THE MAJOR EFFECTS OF MINING ON LAND, WATER, VEGETATION AND WILDLIFE.

2. HAVE THE STUDENTS RECOMMEND A LOGICAL LAND USE SYSTEM FOR A MINED AREA AFTER COMPLETING AN ANALYSIS OF THE SITE. HAVE A SOIL CONSERVATION SERVICE REPRESENTATIVE OR A QUALIFIED LAND RECLAMATION SPECIALIST OR EMPLOYEE ASSIST IN EVALUATION OF THE PLANS, IF NECESSARY.

3. IF FEASIBLE, HAVE THE STUDENTS DEVELOP AND IMPLEMENT A PLAN FOR RECLAIMING A DESIGNATED MINED AREA WHICH INCLUDES SELECTING THE LAND USE SYSTEM AND MANAGING WATER, VEGETATION AND WILDLIFE IN COOPERATION WITH A MINING FIRM. EVALUATE THE STUDENTS ON THE GENERAL EFFECTIVENESS OF THE PLAN AND THEIR ABILITY TO PERFORM THE RECLAMATION TASKS.

4. HAVE THE STUDENTS DEMONSTRATE THE ABILITY TO OPERATE TOOLS AND EQUIPMENT USED IN MINED LAND RESTORATION IN ACTUAL SITUATIONS OR IN SIMULATED STITUATIONS ON THE LAND LABORATORY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. WATER TEST KIT

2. SOIL AUGER AND PROBES

3. SOIL TEST KIT

4. TREE PLANTING BARS

F. EXAMPLES OF SUPPORTING REFERENCES

1. PFLIEDER, E. P. SURFACE MINING. NEW YORK, NEW YORK: THE AMERICAN INSTITUTE OF MINING, METALLURGICAL AND PETROLEUM ENGINEERS, INC. 1968.

   THIS REFERENCE CONTAINS A DESCRIPTION OF THE BASIC SURFACE MINING OPERATIONS AND METHODS.

2. RESTORING SURFACE MINED LAND. BULLETIN NO. 1082. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1968.

   THIS BULLETIN PROVIDES AN OVERVIEW OF THE METHODS USED IN RESTORING SURFACE MINED LAND.

V

OUTDOOR RECREATION
U.S.O.E. CODE 01.06 02 00 00

ESTABLISHING AN OUTDOOR RECREATION ENTERPRISE

ADMINISTRATION AND MANAGEMENT OF AN OUTDOOR RECREATION ENTERPRISE

ESTABLISHING AND MAINTAINING CAMPING AND PICNIC AREAS

DEVELOPING, OPERATING AND MAINTAINING WATER-ORIENTED RECREATION ENTERPRISES

DEVELOPMENT OF WINTER RECREATION AREAS

ESTABLISHING AND OPERATING VACATION FARMS AND DUDE RANCHES

ESTABLISHING RIDING STABLES AND RIDING AND HIKING TRAILS

SHOOTING PRESERVE ESTABLISHMENT, MANAGEMENT AND MAINTENANCE

GOLF COURSE MAINTENANCE

ESTABLISHING AN OUTDOOR RECREATION ENTERPRISE

UNIT CONCEPT: SELECTION OF OUTDOOR RECREATION ENTERPRISES BASED ON SITE ANALYSIS AND DETAILED PLANNING BEFORE DEVELOPMENT WILL CONTRIBUTE TO ENTERPRISE SUCCESS AND EASE OF MANAGEMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING FEDERAL, STATE AND LOCAL DATA, IDENTIFY THE DEMANDS BY THE PUBLIC FOR DIFFERENT TYPES OF OUTDOOR RECREATION EXPERIENCES IN HIS REGION.

2. INVENTORY THE OUTDOOR RECREATION ENTERPRISES IN A GIVEN AREA WITH ACCURACY NEEDED TO DEVELOP A LIST OF ADDITIONAL OUTDOOR ENTERPRISES THAT ARE FEASIBLE CONSIDERING LOCATION, NEEDED FACILITIES AND VEGETATION.

3. MAKE AN ANALYSIS OF A DESIGNATED SITE TO DETERMINE THE ALTERNATIVE OUTDOOR RECREATION ENTERPRISES THAT COULD BE ESTABLISHED THERE.

4. SELECT THE THREE MOST SUITABLE OUTDOOR RECREATION ENTERPRISES FOR A DESIGNATED AREA CONSIDERING THE ALTERNATIVE ENTERPRISES, LOCATION, COMMUNITY AND MANAGEMENT REQUIRED.

5. PREPARE A LONG-RANGE DEVELOPMENT PLAN (5-10 YEARS) FOR A SELECTED ENTERPRISE CONSIDERING INITIAL AND ADDITIONAL DEVELOPMENTS AND MANAGEMENT REQUIREMENTS.

6. USING COST AND RETURN DATA FROM SIMILAR ENTERPRISES, PREPARE A BUDGET FOR A DESIGNATED ENTERPRISE WHICH WOULD INCLUDE FIXED COSTS, VARIABLE COSTS, GROSS RETURNS, NET RETURNS, AND LABOR AND MANAGEMENT INCOME.

7. WHEN GIVEN A SPECIFIC SITE AND ENTERPRISE TO BE ESTABLISHED, PREPARE A SHORT-TERM DEVELOPMENT PLAN WHICH INCLUDES FACILITY CONSTRUCTION, ADVERTISING AND INITIAL MANAGEMENT NEEDS.

B. INSTRUCTIONAL AREAS

1. EVALUATING THE DEMAND FOR OUTDOOR RECREATION

A. IDENTIFYING THE FACTORS WHICH AFFECT THE DEMAND FOR OUTDOOR RECREATION

B. EVALUATING TOTAL INCOME POTENTIAL FROM OUTDOOR RECREATION ENTERPRISES

(1) NATIONAL
(2) STATE
(3) LOCAL

2. SELECTING ADDITIONAL OUTDOOR RECREATION ENTERPRISES FOR A COMMUNITY

A. INVENTORYING CURRENT ENTERPRISES

B. IDENTIFYING DEMAND FOR ALTERNATIVE ENTERPRISES

(1) CONSIDERING THE LOCATION
(2) IDENTIFYING DISTANCES FROM POPULATION CENTERS
(3) IDENTIFYING TOPOGRAPHICAL FEATURES
(4) IDENTIFYING VEGETATION FEATURES

C. DETERMINING ADDITIONAL FACILITY REQUIREMENTS

3. ANALYZING THE SITE POTENTIAL

A. INVENTORYING THE NATURAL RESOURCES

(1) WATER
(2) EXISTING VEGETATION
(3) LAND AREA
(4) DRAINAGE
(5) SOIL
(6) TOPOGRAPHY

B. ANALYZING THE ACCESSIBILITY TO THE AREA

(1) ROADS
(2) SERVICES

C. INVESTIGATING REGULATIONS AND RESTRICTIONS

(1) ZONING
(2) BUILDING CODES

D. IDENTIFYING COMPETITIVE AND COMPLEMENTARY ENTERPRISES

E. IDENTIFYING HISTORICAL OR SCENIC ATTRACTIONS

3. SELECTING THE TYPE OF RECREATION ENTERPRISE FOR A DESIGNATED SITE

A. DETERMINING ALTERNATIVE SITE DEVELOPMENT POSSIBILITIES

(1) MATCHING ENTERPRISE REQUIREMENTS WITH SITE CHARACTERISTICS
(2) DETERMINING LOCAL AREA FACTORS
(3) DETERMINING COMMUNITY ACCEPTANCE
(4) IDENTIFYING OWNER/OPERATOR MANAGEMENT ABILITIES AND OBJECTIVES
(5) DETERMINING THE DEMAND FOR THE ALTERNATIVE ENTERPRISES

4. PLANNING THE SELECTED ENTERPRISE

A. PREPARING A LONG-RANGE DEVELOPMENT PLAN

B. PREPARING THE COST-RETURN ESTIMATE

(1) DETERMINING INVESTMENT AND FIXED COSTS
(2) DETERMINING OPERATING COSTS
(3) IDENTIFYING GROSS AND NET RETURNS
(4) CALCULATING LABOR AND MANAGEMENT INCOME

5. PREPARING AND IMPLEMENTING THE SHORT-TERM DEVELOPMENT PLAN

A. IDENTIFYING INITIAL CONSTRUCTION NEEDS

B. DETERMINING PUBLICITY NEEDS

C. INVESTIGATING INSURANCE NEEDS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE SELECTED STUDENTS RESEARCH THE DEMAND FOR OUTDOOR RECREATION ON THE LOCAL, STATE AND NATIONAL LEVEL AND PRESENT THEIR FINDINGS TO THE CLASS.

2. INVENTORY PRESENT AND POTENTIAL OUTDOOR RECREATION ENTERPRISES IN THE COMMUNITY.

3. INVENTORY A DESIGNATED SITE TO DETERMINE ITS POTENTIAL AS AN OUTDOOR RECREATION AREA.

4. TAKE FIELD TRIPS TO EXISTING AND PLANNED OUTDOOR RECREATION AREAS AND DISCUSS WITH THE OWNERS OR DEVELOPERS THE FACTORS THEY CONSIDERED WHEN SELECTING THE ENTERPRISE.

5. HAVE AN OWNER OR OPERATOR OF AN OUTDOOR RECREATION ENTERPRISE DISCUSS HIS LONG-RANGE DEVELOPMENT PLANS WITH THE STUDENTS.

6. MAKE A BUDGET FOR DEVELOPING AND/OR OPERATING AN OUTDOOR RECREATION ENTERPRISE ON A GIVEN SITE ASSUMING AVERAGE COSTS AND RETURNS.

7. DEVELOP A SMALL OUTDOOR RECREATION AREA OR ENTERPRISE AT HOME OR ON THE SCHOOL LAND LABORATORY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THE GENERAL FACTORS WHICH AFFECT THE DEMAND FOR OUTDOOR RECREATION IN THE COUNTRY.

2. HAVE THE STUDENTS INVENTORY THE OUTDOOR RECREATION ENTERPRISES IN THE COUNTY. EVALUATE THE STUDENTS ON THEIR COMPLETENESS.

3. HAVE THE STUDENTS INVENTORY THE NATURAL RESOURCES ON A DESIGNATED SITE WHICH COULD BE CONSIDERED FOR AN OUTDOOR RECREATION ENTERPRISE. EVALUATE THE STUDENTS ON THE COMPLETENESS AND ACCURACY OF THE INVENTORY.

4. HAVE EACH STUDENT LIST AND DESCRIBE THREE OUTDOOR RECREATION ENTERPRISES THAT COULD BE DEVELOPED ON THE INVENTORIED SITE. EACH STUDENT SHOULD BE ABLE TO JUSTIFY HIS SELECTIONS.

5. HAVE EACH STUDENT PREPARE A LONG-RANGE DEVELOPMENT PLAN FOR ONE OF THE SELECTED ENTERPRISES FOR THE INVENTORIED SITE. EVALUATE THE PLANS ON THEIR COMPLETENESS AND ACCURACY.

6. HAVE EACH STUDENT PREPARE A BUDGET FOR THE SELECTED ENTERPRISE ON WHICH THE LONG-RANGE PLAN WAS DEVELOPED. THE PLANS SHOULD INCLUDE THE INVESTMENT REQUIRED, FIXED COSTS, VARIABLE COSTS, GROSS RETURNS, NET RETURNS, AND LABOR AND MANAGEMENT INCOME.

7. HAVE EACH STUDENT PREPARE A SHORT-TERM DEVELOPMENT PLAN FOR THE SELECTED ENTERPRISE. THE PLAN SHOULD INCLUDE INITIAL CONSTRUCTION, ADVERTISEMENT AND MANAGEMENT FACTORS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SURVEYING EQUIPMENT

2. HAND AND POWER TOOLS FOR LAND CLEARING AND DEVELOPMENT

3. CARPENTRY AND MASONRY TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. GUIDELINES TO PLANNING, DEVELOPING AND MANAGING RURAL RECREATION ENTERPRISES. BULLETIN NO. 301. BLACKSBURG, VIRGINIA: THE COOPERATIVE EXTENSION SERVICE, VIRGINIA POLYTECHNIC INSTITUTE. 1966, 425 PAGES.

   THIS BOOKLET PROVIDES SPECIFIC INFORMATION FOR DEVELOPING EACH TYPE OF OUTDOOR RECREATION ENTERPRISE. IT ALSO CONTAINS A DESCRIPTION OF THE SERVICES GOVERNMENT AGENCIES PROVIDE FOR OUTDOOR RECREATION ENTERPRISE DEVELOPERS, OWNERS AND OPERATORS.

2. PLANNING GUIDE --- OUTDOOR RECREATION FACILITIES. BULLETIN NO. 441. COLUMBUS, OHIO: THE COOPERATIVE EXTENSION SERVICE, THE OHIO STATE UNIVERSITY. 1963, 12 PAGES.

   THIS BULLETIN OFFERS A STEP-BY-STEP GUIDE FOR ESTABLISHING AN OUTDOOR RECREATION ENTERPRISE AS OUTLINED IN THIS UNIT.

3. RURAL RECREATION --- A NEW FAMILY FARM BUSINESS. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1962, 56 PAGES.

   THIS BULLETIN INCLUDES GENERAL INFORMATION CONCERNING THE TYPES OF OUTDOOR RECREATION ENTERPRISES SUITED TO FARMLAND AS WELL AS SPECIFIC EXAMPLES OF ENTERPRISES IN OPERATION.

4. SMITH, CLODUS R. RURAL RECREATION FOR PROFIT. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, 319 PAGES.

   THIS TEXT CONSIDERS THE PLANNING AND OPERATIONAL ASPECTS OF EACH OF THE MAJOR CATEGORIES OF OUTDOOR RECREATION ENTERPRISES AND ALSO GIVES ATTENTION TO MANAGEMENT REQUIREMENTS.

ADMINISTRATION AND MANAGEMENT OF AN OUTDOOR RECREATION ENTERPRISE

UNIT CONCEPT: IF THE OUTDOOR RECREATION ENTERPRISE OWNER OR OPERATOR DEVELOPS COMPETENT ADMINISTRATIVE AND MANAGEMENT PROCEDURES, HE WILL INCREASE THE LIKLIHOOD OF ENTERPRISE SUCCESS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE SOURCES OF FINANCIAL AND TECHNICAL ASSISTANCE FOR OUTDOOR RECREATION ENTERPRISES ON THE LOCAL, STATE AND FEDERAL LEVEL.

2. USING APPROPRIATE RECORD BOOKS AND FORMS, DEMONSTRATE THE BASIC BOOKKEEPING PROCEDURES ESSENTIAL TO AN OUTDOOR RECREATION ENTERPRISE WITH COMPETENCY REQUIRED TO KEEP ACCURATE ENTERPRISE RECORDS.

3. USING FEDERAL, STATE AND LOCAL CODES AND REGULATIONS, IDENTIFY LAWS PERTAINING TO A DESIGNATED OUTDOOR RECREATION ENTERPRISE.

4. WHEN GIVEN A SPECIFIED OUTDOOR RECREATION ENTERPRISE, IDENTIFY THE INSURANCE PROGRAM NEEDED TO PREVENT LOSSES IN CASE OF EMPLOYEE OR CLIENTELE ACCIDENTS.

5. WHEN GIVEN A SPECIFIED TYPE OF OUTDOOR RECREATION ENTERPRISE, DEVELOP A COMPREHENSIVE SAFETY PROGRAM WHICH WILL PROVIDE SAFE CONDITIONS FOR EMPLOYEES AND CLIENTELE.

6. USING THE DIFFERENT MEDIA, DEVELOP A COMPLETE PUBLIC RELATIONS PROGRAM FOR A GIVEN OUTDOOR RECREATION ENTERPRISE IN ORDER THAT THE DESIRED NUMBER AND TYPE OF CLIENTELE ARE REACHED.

7. DEVELOP A COMPREHENSIVE EMPLOYEE RELATIONS PROGRAM FOR A GIVEN ENTERPRISE CONTAINING COMPENSATIONS, ATTITUDE DEVELOPMENT AND IN-SERVICE TRAINING.

B. INSTRUCTIONAL AREAS

1. DETERMINING AVAILABLE FINANCIAL ASSISTANCE

A. IDENTIFYING FEDERAL ASSISTANCE PROGRAMS

B. IDENTIFYING STATE AND LOCAL GOVERNMENT ASSISTANCE PROGRAMS

C. IDENTIFYING SOURCES OF PRIVATE ASSISTANCE

2. DETERMINING AVAILABLE TECHNICAL ASSISTANCE

A. IDENTIFYING LOCAL, STATE AND FEDERAL GOVERNMENT ASSISTANCE PROGRAMS

B. IDENTIFYING PRIVATE ASSISTANCE PROGRAMS

3. DEVELOPING BOOKKEEPING SKILLS

A. IDENTIFYING BUSINESS TERMS AND PROCEDURES

B. SELECTING THE RECORD KEEPING SYSTEM

C. DETERMINING TAX ASSESSMENTS AND TAX STRUCTURE

4. DETERMINING RELEVANT LAWS AND REGULATIONS

A. ZONING REGULATIONS

B. WATER AND SANITATION REGULATIONS

C. FIRE REGULATIONS

D. LAW ENFORCEMENT REGULATIONS

E. WILD GAME AND ANIMAL REGULATIONS

5. DETERMINING INSURANCE PROGRAM NEEDS

A. IDENTIFYING KINDS OF INSURANCE NEEDS

B. DETERMINING AMOUNTS OF NEEDED INSURANCE

C. IDENTIFYING SOURCES OF INSURANCE

6. ESTABLISHING A COMPREHENSIVE SAFETY PROGRAM

A. IDENTIFYING SAFETY PROCEDURES APPLICABLE TO THE ENTERPRISE

B. DETERMINING SAFETY EQUIPMENT NEEDS

7. DEVELOPING THE PUBLIC RELATIONS PROGRAM

   A. SELECTING THE MEDIA TO USE

   B. DETERMINING THE AMOUNT OF PUBLIC RELATIONS NEEDED

   C. DEVELOPING PUBLIC RELATIONS MATERIALS

8. DEVELOPING EMPLOYEE RELATIONS

   A. DEVELOPING A COMPENSATION PROGRAM

   B. PROMOTING GOOD EMPLOYEE ATTITUDES

   C. DEVELOPING AN IN-SERVICE TRAINING PROGRAM

9. DEVELOPING CUSTOMER RELATIONS

   A. REGISTERING OF GUESTS

   B. PROVIDING HOSPITALITY

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USE FEDERAL HOUSING AUTHORITY (FHA) AND BANK REPRESENTATIVES TO DISCUSS GOVERNMENT AND PRIVATE FINANCIAL ASSISTANCE PROGRAMS.

   B. USE AREA SOIL CONSERVATION SERVICE TECHNICIANS AND COOPERATIVE EXTENSION SERVICE AGENTS AS RESOURCE PERSONS TO DISCUSS AVAILABLE TECHNICAL ASSISTANCE FOR OUTDOOR RECREATION ENTERPRISES.

2. RESEARCH RECORD KEEPING METHODS THAT COULD BE USED IN AN OUTDOOR RECREATION ENTERPRISE.

3. HAVE REPRESENTATIVES OF COUNTY HEALTH DEPARTMENTS, ZONING COMMISSIONS AND LAW ENFORCEMENT AGENCIES AS RESOURCE PERSONS TO DISCUSS LEGAL RESTRICTIONS TO OUTDOOR RECREATION ENTERPRISES.

4. INVITE INSURANCE COMPANY AGENTS TO DISCUSS KINDS, TYPES AND COSTS OF INSURANCE FOR DIFFERENT OUTDOOR RECREATION ENTERPRISES.

5. OBSERVE OPERATING OUTDOOR RECREATION ENTERPRISES TO DETERMINE SAFETY PROGRAMS AND EQUIPMENT NEEDED.

6. A. DESIGN A BROCHURE AND WRITE ADVERTISING COPY FOR A DESIGNATED OUTDOOR RECREATION ENTERPRISE.

B. CONTACT TELEVISION AND RADIO STATIONS AND NEWSPAPERS TO DETERMINE ADVERTISING COSTS.

7. DISCUSS PERSONNEL RELATIONS WITH OUTDOOR RECREATION ENTERPRISE OPERATORS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST FIVE SOURCES OF FINANCIAL ASSISTANCE AND FIVE SOURCES OF TECHNICAL ASSISTANCE FOR OUTDOOR RECREATION ENTERPRISES AND DESCRIBE THE SERVICES OR ASSISTANCE THAT IS AVAILABLE FROM EACH.

2. HAVE THE STUDENTS COMPLETE SECTIONS OF COMMONLY USED ENTERPRISE RECORD BOOKS WITH HYPOTHETICAL DATA FROM AN OUTDOOR RECREATION ENTERPRISE.

3. WHEN GIVEN A SPECIFIED OUTDOOR RECREATION ENTERPRISE, HAVE THE STUDENTS LIST THE MAJOR FEDERAL, STATE AND LOCAL LAWS AND/OR REGULATIONS THAT WOULD APPLY TO IT.

4. FOR A GIVEN HYPOTHETICAL OUTDOOR RECREATION ENTERPRISE, HAVE THE STUDENTS LIST AND EXPLAIN THE INSURANCE NEEDS THAT WOULD APPLY TO THAT ENTERPRISE.

5. HAVE EACH STUDENT DEVELOP A LIST OF SAFETY PRACTICES SUITABLE FOR A DESIGNATED OUTDOOR RECREATION ENTERPRISE.

6. HAVE EACH STUDENT DEVELOP A COMPLETE ADVERTISEMENT PROGRAM FOR A GIVEN ENTERPRISE. IN DEVELOPING THE ADVERTISING, EACH STUDENT SHOULD DESIGN A BROCHURE AND WRITE ONE ITEM OF ADVERTISING COPY.

7. HAVE EACH STUDENT LIST THE MAJOR ITEMS THAT SHOULD BE CONSIDERED WHEN DEVELOPING A COMPREHENSIVE EMPLOYEE RELATIONS PROGRAM FOR AN OUTDOOR RECREATION ENTERPRISE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. RECORD BOOKS

2. TAX FORMS

3. INSURANCE FORMS

4. DRAWING INSTRUMENTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. FEDERAL ASSISTANCE IN OUTDOOR RECREATION. WASHINGTON, D.C.: SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE. 1966, 83 PAGES.

   THIS BOOKLET LISTS THE SOURCES OF ASSISTANCE TO OUTDOOR RECREATION ENTERPRISE OWNERS AND/OR OPERATORS IN THE DIFFERENT FEDERAL GOVERNMENT DEPARTMENTS AND BUREAUS. IT ALSO INCLUDES A BRIEF DESCRIPTION OF THE TYPE OF ASSISTANCE AVAILABLE AND THE APPROPRIATE PERSON TO CONTACT FOR INFORMATION.

2. PRIVATE ASSISTANCE IN OUTDOOR RECREATION. WASHINGTON, D.C.: U.S. DEPARTMENT OF INTERIOR, U.S. GOVERNMENT PRINTING OFFICE. 1968, 68 PAGES.

   THIS BOOKLET LISTS THE SOURCES OF PRIVATE ASSISTANCE IN OUTDOOR RECREATION AND GIVES A BRIEF DESCRIPTION OF THE ASSISTANCE PROVIDED.

3. SMITH, CLODUS R. RURAL RECREATION FOR PROFIT. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, 319 PAGES.

   THIS TEXT CONTAINS CHAPTERS CONCERNING SOURCES OF FINANCIAL AND TECHNICAL ASSISTANCE AND ENTERPRISE OPERATION AND MAINTENANCE.

4. THE WHY AND WHAT OF BOOKKEEPING. CURRENT EDITION. WASHINGTON, D.C.: SMALL BUSINESS ADMINISTRATION, U.S. DEPARTMENT OF LABOR.

   THIS BOOKLET GIVES AN OVERVIEW OF THE NEED FOR USING GOOD BOOKING PROCEDURES AND WHAT PROCEDURES MIGHT BE USED.

ESTABLISHING AND MAINTAINING CAMPING AND PICNIC AREAS

UNIT CONCEPT: COMPETENT SITE SELECTION, LAYOUT, MANAGEMENT AND MAINTENANCE OF CAMPING AND PICNIC AREAS WILL RESULT IN GREATER CLIENTELE SATISFACTION AND CONTRIBUTE TO ENTERPRISE SUCCESS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. SELECT AN APPROPRIATE SITE FOR A CAMPING AREA WITH REGARD TO PHYSICAL AND SOCIOECONOMIC FACTORS WHICH WILL CONTRIBUTE TO ENTERPRISE SUCCESS.

2. USING NECESSARY SURVEYING EQUIPMENT, LAY OUT A CAMPING AREA ON A SELECTED SITE SO THAT IT WOULD BE MOST DESIRABLE FOR THE CLIENTELE AND FOR EASE OF MANAGEMENT.

3. SELECT THE SUPPLEMENTAL ENTERPRISES FOR A CAMPING AREA AND/OR PICNIC AREA ENTERPRISE WHICH WOULD BE MOST PROFITABLE AND OF GREATEST SERVICE TO THE CLIENTELE.

4. USING MECHANICAL AND CHEMICAL METHODS, DEVELOP AND IMPLEMENT A VEGETATION AND PEST CONTROL PROGRAM FOR A CAMPING AREA AND/OR PICNIC AREA WHICH WILL INCREASE THE AESTHETIC VALUE OF THE AREA AND INCREASE SANITATION AND SAFETY CONDITIONS.

5. SELECT AN APPROPRIATE SITE FOR A PICNIC AREA CONSIDERING PHYSICAL AND SOCIOECONOMIC FACTORS WHICH WILL CONTRIBUTE TO ENTERPRISE SUCCESS.

6. USING NECESSARY SURVEYING EQUIPMENT, LAY OUT A PICNIC AREA ON A DESIGNATED SITE WHICH WILL BE MOST DESIRABLE FOR THE CLIENTELE AND FOR EASE OF MANAGEMENT.

7. PERFORM MANAGEMENT AND MAINTENANCE OPERATIONS NECESSARY TO SUCCESSFULLY OPERATE A CAMPING AND/OR PICNIC AREA.

B. INSTRUCTIONAL AREAS

1. SELECTING THE TYPE OF CAMPING AREA ENTERPRISE TO ESTABLISH

A. DETERMINING INVESTMENT COSTS

B. IDENTIFYING MANAGEMENT SKILLS AND TIME REQUIRED

C. DETERMINING DEMAND FOR ALTERNATIVE CAMPING AREA FACILITIES IN THE COMMUNITY

2. SELECTING A SITE FOR A CAMPING AREA

A. DETERMINING PHYSICAL FACTORS

(1) IDENTIFYING WATER RESOURCES
(2) IDENTIFYING TOPOGRAPHICAL FACTORS AND NATURAL ATTRACTIONS
(3) EVALUATING VEGETATIVE FACTORS
(4) EVALUATING WILDLIFE FACTORS

B. DETERMINING SOCIOECONOMIC FACTORS

(1) EVALUATING GEOGRAPHIC LOCATION
(2) DETERMINING ECONOMIC AND BUSINESS MANAGEMENT FACTORS
(3) EVALUATING PROPOSED FACILITIES
(4) EVALUATING THE PROPOSED CARRYING CAPACITY OF THE ENTERPRISE

3. LAYING OUT THE CAMPING AREA

A. LOCATING CAMP SITES AND FACILITIES

(1) DETERMINING THE AMOUNT OF AREA FOR EACH SITE
(2) PROVIDING EASY ACCESS TO ROADWAY
(3) PROVIDING DRAINAGE

B. DEVELOPING THE ROAD NETWORK

C. LOCATING IMPROVEMENTS

(1) LOCATING WATER AND SANITATION FACILITIES
(2) LOCATING BARRIERS, GATES, SIGNS, TRAILS AND PATHS
(3) LOCATING BUILDINGS

D. LANDSCAPING THE AREA

E. OPERATING AND MAINTAINING TOOLS AND EQUIPMENT

4. PROVIDING FOR SANITATION AND SAFETY

A. DEVELOPING THE WATER SUPPLIES

(1) REQUIREMENTS

(2) SOURCES
(3) TREATMENT
(4) DISTRIBUTION

B. DEVELOPING THE SANITATION SYSTEM

(1) SELECTING, OPERATING AND MAINTAINING THE SEWAGE DISPOSAL SYSTEM
(2) SELECTING, OPERATING AND MAINTAINING THE GARBAGE COLLECTION AND DISPOSAL SYSTEM

C. DEVELOPING AND MAINTAINING THE ELECTRICAL SYSTEM

D. CONTROLLING INSECTS AND PESTS

5. DEVELOPING SUPPLEMENTAL ENTERPRISES

A. STORES AND CONCESSIONS

B. RENTALS

6. MAINTAINING THE CAMPING AREA

A. CONTROLLING VEGETATION

B. REPAIRING FACILITIES

C. DESIGNING AND MAINTAINING SIGNS

D. OPERATING AND REPAIRING EQUIPMENT

7. SELECTING THE SITE FOR A PICNIC AREA

A. CONSIDERING TYPE OF PICNIC AREA BEING DEVELOPED

B. EVALUATING PHYSICAL SITE CHARACTERISTICS

C. EVALUATING SOCIOECONOMIC FACTORS

8. LAYING OUT A PICNIC AREA

A. LOCATING ROADS

B. LOCATING IMPROVEMENTS

(1) PROVIDING WATER AND SANITATION FACILITIES
(2) LOCATING BARRIERS, GATES AND SIGNS
(3) LOCATING TRAILS AND PATHS

C. PERFORMING NECESSARY LANDSCAPING

10. MAINTAINING THE PICNIC AREA

    A. CONTROLLING VEGETATION

    B. CONTROLLING INSECTS AND PESTS

    C. REPAIRING FACILITIES

    D. OPERATING AND REPAIRING EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. TAKE FIELD TRIPS TO PROPOSED AND OPERATING CAMPING AND PICNIC AREAS TO DISCUSS WITH THE OWNERS AND/OR OPERATORS THE FACTORS THAT WERE CONSIDERED WHEN THE SITE WAS SELECTED.

2. HAVE THE STUDENTS LAY OUT A CAMPING AREA ON A SITE ON THE LAND LABORATORY USING THE NECESSARY SURVEYING EQUIPMENT AND STAKING OUT THE PROPOSED FACILITIES.

3. WHEN TAKING FIELD TRIPS TO ESTABLISHED CAMPING AREAS, HAVE THE STUDENTS OBSERVE AND DISCUSS WITH THE OWNERS AND/OR OPERATORS THE SUPPLEMENTAL ENTERPRISES THAT ARE IN OPERATION AND THE FACTORS THAT WERE CONSIDERED WHEN SELECTING THEM.

4. DEVELOP A DEMONSTRATION OF THE DIFFERENT MECHANICAL AND CHEMICAL MEANS OF CONTROLLING VEGETATION. HAVE EACH STUDENT OPERATE THE EQUIPMENT THAT IS DEMONSTRATED.

5. TAKE FIELD TRIPS TO ESTABLISHED PICNIC AREAS TO OBSERVE THE FACTORS CONSIDERED IN SITE SELECTION.

6. HAVE THE STUDENTS LAY OUT A PICNIC AREA ON A SELECTED SITE ON THE LAND LABORATORY.

7. IF IT IS FEASIBLE TO ESTABLISH A CAMPING AREA OR PICNIC AREA ON THE LAND LABORATORY, HAVE THE STUDENTS DEVELOP AND IMPLEMENT A PLAN FOR ADMINISTERING, MANAGING AND MAINTAINING IT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS SELECT AN APPROPRIATE SITE FOR A CAMPING AREA ON THE LAND LABORATORY. EVALUATE THE STUDENTS AS TO HOW WELL THEY CAN JUSTIFY USING THE SELECTED SITE.

2. HAVE THE STUDENTS LAY OUT A COMPLETE CAMPING AREA ON A DESIGNATED SITE ON THE LAND LABORATORY. THE STUDENTS

SHOULD BE EVALUATED ON USE OF APPROPRIATE PROCEDURES AND ABILITY TO OPERATE THE EQUIPMENT.

3. HAVE EACH STUDENT MAKE A COMPLETE PLAN FOR DEVELOPING SUPPLEMENTAL ENTERPRISES TO A CAMPING AREA AND JUSTIFY HIS ENTERPRISE SELECTION.

4. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO SAFELY OPERATE AND MAINTAIN EQUIPMENT USED IN VEGETATION AND PEST CONTROL.

5. HAVE EACH STUDENT LIST THE FACTORS THAT SHOULD BE CONSIDERED WHEN SELECTING A PICNIC AREA SITE. THE LISTS SHOULD INCLUDE THE PHYSICAL, SOCIOECONOMIC AND GEOGRAPHICAL FACTORS.

6. HAVE THE STUDENTS LAY OUT A PICNIC AREA ON THE LAND LABORATORY. EVALUATION SHOULD BE BASED ON THE METHODS USED AND ABILITY TO OPERATE THE NECESSARY LAND MEASUREMENT AND SURVEYING EQUIPMENT.

7. HAVE EACH STUDENT LIST THE MANAGEMENT AND MAINTENANCE SKILLS REQUIRED OF A CAMPING AREA OR PICNIC AREA OWNER, OPERATOR OR EMPLOYEE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. LAND MEASUREMENT AND SURVEYING EQUIPMENT

2. FORESTRY TOOLS AND EQUIPMENT TO BE USED FOR LAND CLEARING AND ROAD, TRAIL AND PATH DEVELOPMENT

3. CARPENTRY AND MASONRY EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMITH, CLODUS R. <u>RURAL RECREATION FOR PROFIT</u>. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, 319 PAGES.

   CHAPTER THREE OF THIS REFERENCE CONTAINS INFORMATION CONCERNING THE DEMAND, INCOME POTENTIAL AND MANAGEMENT OF CAMPING AREA AND PICNIC AREA ENTERPRISES.

DEVELOPING, OPERATING AND MAINTAINING WATER-ORIENTED RECREATION ENTERPRISES

UNIT CONCEPT: THE USE OF SOUND PROCEDURES IN ESTABLISHING, OPERATING AND MAINTAINING WATER-ORIENTED ENTERPRISES WILL HELP ENSURE SUCCESS OF THE ENTERPRISES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. SELECT AND DEVELOP A SITE FOR A BEACH AND SWIMMING AREA ON AN EXISTING OR PLANNED WATER IMPOUNDMENT WHICH WILL BE APPEALING TO THE CLIENTELE AND PROMOTE SAFETY AND EASE OF MANAGEMENT.

2. DEVELOP A SAFETY PLAN FOR A BEACH AND SWIMMING AREA WHICH WILL MINIMIZE THE NUMBER AND SEVERITY OF ACCIDENTS TO EMPLOYEES AND CLIENTELE.

3. DETERMINE THE SUPPLEMENTAL AND SUPPORTING FACILITIES THAT SHOULD BE ESTABLISHED FOR A BEACH AND SWIMMING AREA WHICH WILL HELP ATTRACT USERS AND INCREASE PROFITS.

4. ESTABLISH, OPERATE AND MAINTAIN A FEE FISHING ENTERPRISE AT A POND, LAKE OR STREAM SO THAT THE ENTERPRISE IS ATTRACTIVE TO THE CLIENTELE AND MAXIMUM PROFITS ARE REALIZED.

5. DEVELOP A PLAN FOR ESTABLISHING A MARINA ON A SELECTED SITE WHICH WILL PROMOTE SAFETY, EASE OF MANAGEMENT AND CLIENTELE SATISFACTION.

6. DEVELOP A MANAGEMENT PLAN WITH SUPPLEMENTAL ENTERPRISES FOR A MARINA WHICH WILL ATTRACT MARINA USERS AND HELP MAXIMIZE ENTERPRISE PROFITS.

7. ESTABLISH, MANAGE AND/OR MAINTAIN A FISHING RESORT WITH COMPETENCY NEEDED TO ATTRACT CUSTOMERS AND MAXIMIZE PROFITS.

8. SELECT, OPERATE AND MAINTAIN THE EQUIPMENT USED IN WATER-ORIENTED ENTERPRISES.

B. INSTRUCTIONAL AREAS

1. ESTABLISHING A SWIMMING AND BEACH AREA

A. SELECTING A SWIMMING SITE

(1) DETERMINING ACCESSIBILITY
(2) IDENTIFYING WATER FEATURES

B. DEVELOPING THE BEACH AREA

(1) DETERMINING SLOPE
(2) SELECTING MATERIALS
(3) DETERMINING PRIVACY DESIRED

C. DEVELOPING SUPPORTING FACILITIES

(1) ESTABLISHING SANITATION FACILITIES
(2) DETERMINING DRINKING FACILITIES REQUIRED
(3) DETERMINING NEEDED DRESSING FACILITIES
(4) DEVELOPING PARKING FACILITIES

(A) DETERMINING COMPOSITION REQUIRED
(B) DETERMINING SPACE REQUIRED

D. DEVELOPING SUPPLEMENTAL FACILITIES

(1) SELECTING AND ESTABLISHING SPORTS AREAS
(2) DEVELOPING CONCESSION STANDS
(3) DEVELOPING PICNIC AREAS

E. PROVIDING FOR SAFETY

(1) DETERMINING WATER QUALITY
(2) IDENTIFYING PHYSICAL HAZARDS
(3) SELECTING SAFETY EQUIPMENT
(4) DETERMINING HEALTH REQUIREMENTS

F. MANAGING THE BEACH AND SWIMMING AREA

(1) SETTING FEES
(2) DEVELOPING CUSTOMER RELATIONS
(3) SELECTING AND OPERATING EQUIPMENT

2. ESTABLISHING FEE FISHING ENTERPRISES

A. DEVELOPING A POND SITE FOR FISH PRODUCTION

(1) REGULATING THE WATER SUPPLY
(2) ESTABLISHING VEGETATIVE COVER IN THE WATERSHED

B. SELECTING FISH SPECIES

(1) IDENTIFYING COMMONLY USED FISH SPECIES
(2) CORRELATING POND CONDITIONS AND FISH SPECIES REQUIREMENTS

C. CONTROLLING WATER QUALITY IN PONDS

(1) IDENTIFYING FISH REQUIREMENTS
(2) CONTROLLING PHYSICAL QUALITY
(3) CONTROLLING CHEMICAL QUALITY

D. MAINTAINING A FEE FISHING POND

(1) MAINTAINING THE BANKS
(2) CONTROLLING ALGAE
(3) CONTROLLING PESTS AND PREDATORS

E. SETTING TRESPASSING AND/OR FISHING FEES

F. PROVIDING FOR SAFETY

3. ESTABLISHING A MARINA

A. SELECTING POINTS OF ACCESS

B. DEVELOPING A BOAT LANDING AREA

(1) DEVELOPING THE APPROACH ROAD AND PARKING
(2) ESTABLISHING THE LAUNCHING RAMP
(3) DEVELOPING WATER AND SANITATION FACILITIES

C. ESTABLISHING SUPPLEMENTAL ENTERPRISES

(1) DEVELOPING BOAT RENTALS AND STORAGE
(2) DEVELOPING A MARINE SERVICE CENTER

D. PROVIDING FOR SAFETY

E. MANAGING THE MARINA

(1) SELECTING AND OPERATING EQUIPMENT
(2) SETTING FEES
(3) DEVELOPING CUSTOMER RELATIONS

F. MAINTAINING THE MARINA

4. ESTABLISHING FISHING RESORTS

A. PLANNING A FISHING CAMP

(1) SELECTING THE LOCATION

(2) SELECTING TYPES OF CABINS
(3) DEVELOPING PICNIC AREAS
(4) DETERMINING MANAGEMENT AND ADMINISTRATIVE TASKS

B. ESTABLISHING FISHING AREAS

(1) DEVELOPING DOCKS AND BOAT LAUNCHES
(2) DEVELOPING BAIT AND TACKLE FACILITIES

C. ESTABLISHING SOURCES OF SUPPLEMENTAL INCOME

(1) DEVELOPING RENTALS
(2) DEVELOPING CONCESSIONS
(3) DEVELOPING BAIT SALES
(4) SETTING FEES AND SELLING LICENSES

D. PROVIDING FOR SAFETY

E. MANAGING AND OPERATING THE FISHING RESORT

(1) SELECTING AND OPERATING EQUIPMENT
(2) DEVELOPING CUSTOMER RELATIONS

F. MAINTAINING THE FISHING RESORT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. TAKE FIELD TRIPS TO PRIVATE AND PUBLIC BEACHES TO OBSERVE ESTABLISHMENT AND MANAGEMENT PRACTICES.

2. DEVELOP A SWIMMING AREA AND/OR BEACH AT THE SCHOOL LAND LABORATORY POND, AT A HOME POND SITE, OR FOR A COOPERATING POND OWNER WITH APPROPRIATE SAFETY FEATURES.

3. HAVE AN OPERATOR OF A BEACH AND SWIMMING AREA DISCUSS WITH THE STUDENTS THE FACTORS TO CONSIDER IN SELECTING SUPPLEMENTAL ENTERPRISES.

4. HAVE THE STUDENTS MANAGE THE SCHOOL LAND LABORATORY POND SO THAT FISHING CONDITIONS ARE OPTIMIZED.

5. TAKE FIELD TRIPS TO EXISTING OR PLANNED MARINAS TO OBSERVE THE LOCATION AND TYPE OF SITE SELECTED.

6. HAVE THE STUDENTS DISCUSS MANAGEMENT AND MAINTENANCE PROCEDURES AND PROBLEMS WITH MARINA OPERATORS.

7. TAKE A FIELD TRIP TO A FISHING RESORT TO OBSERVE MANAGEMENT AND MAINTENANCE PROCEDURES.

8. HAVE PAIRS OF STUDENT DEVELOP CLASS DEMONSTRATIONS FOR OPERATION AND MAINTENANCE OF EQUIPMENT USED IN WATER-ORIENTED ENTERPRISES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS SELECT THE MOST APPROPRIATE SITE FOR A BEACH AREA OR A MARINA ON A DESIGNATED WATER IMPOUNDMENT AND WRITE THEIR JUSTIFICATION OF THE SELECTION.

2. HAVE THE STUDENTS DEVELOP A SAFETY PROGRAM FOR A BEACH WHICH SHOULD INCLUDE SAFETY PRACTICES AND NEEDED EQUIPMENT.

3. ASSIGN THE STUDENTS A HYPOTHETICAL SWIMMING AND BEACH ENTERPRISE FOR WHICH THEY ARE TO SELECT THE MOST FEASIBLE SUPPLEMENTAL ENTERPRISES. THEY SHOULD ALSO INDICATE THE RATIONALE USED IN SELECTING THE ENTERPRISES.

4. HAVE THE STUDENTS PERFORM WATERSHED AND POND MAINTENANCE PROCEDURES ON THE SCHOOL LAND LABORATORY POND. EVALUATE THE STUDENTS ON THEIR ABILITY TO OPERATE THE TOOLS AND EQUIPMENT AND TO CORRECTLY PERFORM THE PROCEDURES.

5. HAVE EACH STUDENT DEVELOP A PLAN FOR ESTABLISHING A MARINA ON A SELECTED SITE. THE PLAN SHOULD INCLUDE SUCH FEATURES AS POINTS OF ACCESS, PARKING, AND LAUNCHING RAMPS AND PROVISIONS FOR WATER AND SANITATION.

6. HAVE EACH STUDENT DEVELOP A MANAGEMENT AND MAINTENANCE PLAN FOR A MARINA TO BE SUBMITTED FOR EVALUATION.

7. HAVE EACH STUDENT DEVELOP A PLAN FOR ESTABLISHING AND MANAGING A FISHING RESORT ON A SELECTED SITE.

8. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO SERVICE AND/OR MAINTAIN AN OUTBOARD BOAT ENGINE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. LAND MEASUREMENT AND SURVEYING EQUIPMENT

2. BOAT --- 14' OR LONGER

3. LIFE JACKET

4. HAND TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMITH, CLODUS, R. RURAL RECREATION FOR PROFIT. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, 319 PAGES.

   CHAPTER FOUR OF THIS REFERENCE CONTAINS INFORMATION CONCERNING THE DEMAND, INCOME POTENTIAL, REQUIREMENTS AND MANAGEMENT OF FISHING WATERS USED FOR OUTDOOR RECREATION ENTERPRISES.

DEVELOPMENT OF WINTER RECREATION AREAS

UNIT CONCEPT: COMPETENT SELECTION OF LOCATION, FACILITY AND EQUIPMENT SELECTION AND DEVELOPMENT, MANAGEMENT AND MAINTENANCE OF WINTER RECREATION AREAS WILL CONTRIBUTE SIGNIFICANTLY TO CLIENTELE SATISFACTION AND ENTERPRISE SUCCESS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING INVENTORY DATA, PRINTED MATERIAL RELATING TO SKIING SLOPES AND LAYOUT SPECIFICATIONS, DEVELOP AND IMPLEMENT A PLAN FOR ESTABLISHING, OPERATING AND MAINTAINING A SKIING AREA WHICH SHOULD INCLUDE LAYING OUT TRAILS AND OTHER FEATURES, PROVIDING CLIENTELE SERVICES AND MAINTAINING THE TRAILS, SNOW AND EQUIPMENT.

2. USING NECESSARY INVENTORY AND ANALYSIS DATA AND EQUIPMENT, DEVELOP AND IMPLEMENT A PLAN FOR A SLED AND TOBOGGAN AREA WHICH SHOULD INCLUDE LAYING OUT AND DEVELOPING TRAILS, PROVIDING CLIENTELE SERVICES AND MAINTAINING THE TRAILS, FACILITIES AND EQUIPMENT.

3. CONSIDERING TERRAIN, WILDLIFE IMPACT AND HAZARDS, DEVELOP AND IMPLEMENT A PLAN FOR A SNOWMOBILING AREA WHICH SHOULD INCLUDE TRAIL AND FACILITY DEVELOPMENT, CLIENTELE SERVICES AND MAINTENANCE.

4. USING A GIVEN WATER IMPOUNDMENT, DEVELOP AND IMPLEMENT A PLAN FOR AN ICE SKATING AREA WHICH SHOULD INCLUDE FACILITY DEVELOPMENT, CLIENTELE SERVICES AND MAINTENANCE.

B. INSTRUCTIONAL AREAS

1. PLANNING AND OPERATING A SKIING AREA

   A. LAYING OUT TRAILS

      (1) SELECTING THE LOCATION
      (2) MARKING AND CLEARING TRAILS
      (3) DEVELOPING NATIONAL AND INTERNATIONAL SKI AREA SIGNS
      (4) DEVELOPING REST AREAS

B. MAINTENANCE OF TRAILS AND SNOW

(1) OPERATING EQUIPMENT
(2) MAINTAINING EQUIPMENT

C. DETERMINING TYPE OF LIFT NEEDED

(1) IDENTIFYING THE TYPES OF LIFTS

(A) ROPE
(B) POMA, PLATTER, J- OR T-BAR
(C) CHAIR
(D) GONDOLA

(2) OPERATING THE LIFT
(3) MAINTAINING THE LIFT

D. PATROLLING THE SLOPES

E. DEVELOPING SUPPLEMENTARY ENTERPRISES

(1) EQUIPMENT SALES AND RENTALS
(2) CONCESSIONS

F. PROVIDING SKIING LESSONS

2. PLANNING AND OPERATING SLED AND TOBOGGAN AREAS

A. LOCATING SLOPES

B. MARKING AND CLEARING TRAILS

C. DEVELOPING COMFORT STATIONS

D. RENTING EQUIPMENT

E. PATROLLING THE AREA

F. MAINTAINING THE AREA

(1) OPERATING THE EQUIPMENT
(2) MAINTAINING THE EQUIPMENT

3. PLANNING AND OPERATING SNOWMOBILE AREAS

A. LOCATING TRACKS AND TRAILS

B. MARKING AND CLEARING TRAILS

(1) EVALUATING EFFECTS ON WILDLIFE
(2) EVALUATING EFFECTS ON NATURAL AREAS

C. DEVELOPING COMFORT STATIONS

D. RENTING SNOWMOBILES AND EQUIPMENT

E. PATROLLING THE TRAILS

F. MAINTAINING THE TRAILS

4. PLANNING AND OPERATING AN OUTDOOR ICE SKATING AREA

A. DEVELOPING FACILITIES

(1) DEVELOPING THE WARMING HOUSE AND COMFORT STATION
(2) DEVELOPING THE SKATING RINK

(A) CLEARING SNOW
(B) MAINTAINING THE ICE
(C) OPERATING AND MAINTAINING TOOLS AND EQUIPMENT

(3) PROVIDING LESSONS
(4) RENTING EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. TAKE A FIELD TRIP TO A SKIING AREA TO OBSERVE FACILITIES, MANAGEMENT AND MAINTENANCE TECHNIQUES.

2. CONSTRUCT A SLED OR TOBOGGAN AREA ON THE SCHOOL LAND LABORATORY OR AT ANOTHER SUITABLE SITE.

3. GIVEN A DESIGNATED AREA, PLAN A SNOWMOBILE TRAIL WITH PROVISIONS FOR REST AREAS AND SAFETY.

4. CONSTRUCT AN ICE SKATING AREA ON THE SCHOOL LAND LABORATORY POND OR ON A COOPERATOR'S POND.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. ON A SPECIFIED SITE, HAVE EACH STUDENT DEVELOP A PLAN FOR A SKI AREA ENTERPRISE. EACH STUDENT SHOULD ALSO LIST APPROXIMATE COSTS FOR DEVELOPING THE ENTERPRISE.

2. ON A SPECIFIED SITE, HAVE THE STUDENTS LAY OUT AND MARK A SLED OR TOBOGGAN AREA FOR EVALUATION AS TO ITS CHALLENGE AND SAFETY.

3. HAVE EACH STUDENT LAY OUT A SNOWMOBILE TRAIL ON A TOPOGRAPHIC MAP GIVING CONSIDERATION TO TERRAIN FEATURES, NATURAL AREAS, AND SAFETY HAZARDS.

4. HAVE EACH STUDENT PREPARE A WORKABLE PLAN FOR THE DEVELOPMENT AND OPERATION OF AN ICE SKATING AREA, INCLUDING:

   A. FACILITIES

   B. SNOW REMOVAL

   C. PROVISION OF CLIENTELE SERVICE

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. FORESTRY EQUIPMENT FOR LAND CLEARING AND CONSTRUCTING TRAILS

2. CARPENTRY AND MASONRY TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMITH, CLODUS R. RURAL RECREATION FOR PROFIT. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, 319 PAGES.

   THIS TEXT CONTAINS INFORMATION CONCERNING OUTDOOR RECREATION ENTERPRISE DEVELOPMENT, MANAGEMENT AND ADMINISTRATION.

ESTABLISHING AND OPERATING VACATION FARMS AND DUDE RANCHES

UNIT CONCEPT: COMPETENT DEVELOPMENT, OPERATION AND MAINTENANCE OF VACATION FARMS AND/OR DUDE RANCHES WILL CONTRIBUTE TO CLIENTELE SATISFACTION AND ENTERPRISE SUCCESS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. CARRY OUT AN EFFECTIVE INVENTORY AND ANALYSIS OF A PROPOSED SITE FOR DEVELOPMENT OF A VACATION FARM OR DUDE RANCH.

2. DEVELOP AND IMPLEMENT A PLAN FOR ESTABLISHING A VACATION FARM OR DUDE RANCH WHICH SHOULD INCLUDE DEVELOPMENT OF FACILITIES AND EQUIPMENT AND SUPPLEMENTAL ENTERPRISES.

3. DEVELOP A PLAN FOR MANAGING A VACATION FARM OR DUDE RANCH WHICH SHOULD INCLUDE SAFETY PROGRAMS, CUSTOMER RELATIONS AND ADVERTISING.

4. OPERATE AND MAINTAIN THE EQUIPMENT AND MAINTAIN THE FACILITIES ON VACATION FARMS AND/OR DUDE RANCHES ACCORDING TO OPERATORS' MANUALS OR MANUFACTURERS' SPECIFICATIONS.

5. SELECT, HANDLE AND CARE FOR HORSES AND OTHER LIVESTOCK USED ON VACATION FARMS AND DUDE RANCHES SO THAT QUALITY LIVESTOCK ARE MAINTAINED AND EMPLOYEE AND CLIENTELE SAFETY IS MAXIMIZED.

B. INSTRUCTIONAL AREAS

1. SELECTING THE VACATION FARM OR DUDE RANCH SITE

   A. DETERMINING DEMAND

   B. INVENTORYING AND ANALYZING THE SITE

   C. DETERMINING NEEDED LAND AND FACILITIES

2. IDENTIFYING POSSIBLE SUPPLEMENTAL ENTERPRISES
   - A. DEVELOPING CABINS, CAMPING SITES AND PICNIC AREAS
   - B. ESTABLISHING FISHING PONDS
   - C. DEVELOPING SPORTS AREAS
   - D. SELECTING CONCESSIONS
3. CONSTRUCTING FACILITIES
   - A. CONSTRUCTING BUILDINGS
   - B. CONSTRUCTING ACCESSORIES
4. MANAGING THE ENTERPRISE
   - A. SELECTING LIVESTOCK
   - B. SELECTING EQUIPMENT
   - C. DETERMINING FEES
   - D. DEVELOPING CUSTOMER RELATIONS
   - E. DEVELOPING SAFETY PROGRAMS
   - F. DETERMINING ADDITIONAL INSURANCE NEEDS
   - G. DEVELOPING THE ADVERTISING PROGRAM
5. HANDLING HORSES AND OTHER LIVESTOCK
   - A. DETERMINING THE FEEDING SYSTEM AND RATIONS
   - B. DEVELOPING THE HEALTH, INJURY PROTECTION AND SANITATION PROGRAM
   - C. DEVELOPING THE BREEDING PROGRAM
   - D. GROOMING LIVESTOCK
   - E. TRAINING HORSES
   - F. DEVELOPING FARRIER SKILLS
6. MAINTAINING THE ENTERPRISE
   - A. LANDSCAPING AND CONTROLLING UNWANTED VEGETATION
   - B. OPERATING AND MAINTAINING SANITATION AND SEWAGE SYSTEMS

C. OPERATING AND MAINTAINING MAINTENANCE EQUIPMENT

D. MAINTAINING BUILDING AND ACCESSORY FACILITIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. DEVELOP A LIST OF FACTORS WHICH COULD BE USED IN INVENTORYING A SITE TO DETERMINE ITS FEASIBILITY AS A VACATION FARM OR DUDE RANCH.

2. VISIT VACATION FARMS AND/OR DUDE RANCHES IN DIFFERENT STAGES OF DEVELOPMENT TO OBSERVE FACILITY AND EQUIPMENT NEEDS.

3. HAVE A VACATION FARM OR RANCH OWNER OR OPERATOR DISCUSS MANAGEMENT TECHNIQUES WITH THE STUDENTS.

4. SURVEY SEVERAL VACATION FARMS OR RANCHES TO DETERMINE EQUIPMENT NEEDS FOR OPERATION AND MAINTENANCE.

5. DEVELOP BALANCED RATIONS AND FEEDING SYSTEMS FOR DIFFERENT SPECIES OF LIVESTOCK.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS DETERMINE THE FEASIBILITY OF DEVELOPING A VACATION FARM OR DUDE RANCH ON A SITE BY COMPLETING A SITE INVENTORY AND ANALYSIS.

2. FOR A PROPOSED VACATION FARM OR RANCH, HAVE THE STUDENTS DEVELOP A LIST OF THE FACILITIES AND EQUIPMENT THAT WOULD NEED TO BE ADDED. THE STUDENTS SHOULD ALSO COMPUTE THE COST OF THE ADDITIONS.

3. HAVE EACH STUDENT LIST THE IMPORTANT FACTORS IN ESTABLISHING A GOOD CUSTOMER RELATIONS PROGRAM.

4. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO OPERATE AND MAINTAIN EQUIPMENT USED ON VACATION FARMS AND/OR RANCHES SUCH AS FARM TRACTORS AND IMPLEMENTS.

5. HAVE EACH STUDENT LIST AT LEAST EIGHT SAFETY PRACTICES WHICH SHOULD BE OBSERVED WHEN HANDLING DIFFERENT SPECIES OF LIVESTOCK.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CARPENTRY AND MASONRY EQUIPMENT

2. LIVESTOCK GROOMING EQUIPMENT

3. ROPES, HALTERS AND OTHER LIVESTOCK HANDLING EQUIPMENT

4. FARRIER EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMITH, CLODUS R. RURAL RECREATION FOR PROFIT. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, 319 PAGES.

   CHAPTER TWO OF THIS TEXT IS DEVOTED TO DEMAND, INCOME POTENTIAL, REQUIREMENTS AND MANAGEMENT OF VACATION FARMS AND RANCHES.

ESTABLISHING RIDING STABLES AND RIDING AND HIKING TRAILS

UNIT CONCEPT: PROPER SELECTION OF FACILITIES, EQUIPMENT AND HORSES AND COMPETENT MANAGEMENT AND MAINTENANCE OF THE HORSEBACK RIDING ENTERPRISE WILL CONTRIBUTE SIGNIFICANTLY TO THE SATISFACTION OF THE CLIENTELE AND ENTERPRISE SUCCESS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. SELECT TYPES AND KINDS OF HORSES FOR A HORSEBACK RIDING ENTERPRISE SO THAT THE NEEDS AND SAFETY OF THE CLIENTELE ARE MET.

2. PROPERLY HANDLE THE HORSES AND EQUIPMENT USED IN HORSEBACK RIDING ENTERPRISES AND MATCH THE HORSES AND RIDERS SO THAT EMPLOYEE AND CLIENT SAFETY IS MAXIMIZED.

3. SELECT THE TYPES AND KINDS OF FACILITIES, EQUIPMENT AND TACK NEEDED FOR A HORSEBACK RIDING ENTERPRISE.

4. PERFORM THE OPERATION AND MAINTENANCE TASKS COMMON TO HORSEBACK RIDING ENTERPRISES.

5. USING TOPOGRAPHIC MAPS AND SURVEYING EQUIPMENT, LAY OUT AND DEVELOP A HIKING AND/OR RIDING TRAIL SO THAT THE TRAILS ARE INTERESTING AND CHALLENGING AS WELL AS SAFE.

B. INSTRUCTIONAL AREAS

1. ESTABLISHING A RIDING STABLE

   A. SELECTING HORSES

   B. ESTABLISHING BUILDING NEEDS

      (1) DETERMINING NEEDS FOR HOUSING STOCK
      (2) DETERMINING NEEDS FOR SHOW RINGS AND TACK ROOMS

   C. SELECTING TACK AND OTHER NECESSARY EQUIPMENT

2. HANDLING THE HORSES

   A. MATCHING HORSES AND RIDERS

   B. DEVELOPING FARRIER SKILLS

   C. FEEDING THE STOCK

   D. GROOMING THE STOCK

3. OPERATING AND MAINTAINING THE RIDING STABLE

   A. SETTING FEES

   B. DEVELOPING CUSTOMER RELATIONS

   C. DEVELOPING THE SAFETY PROGRAM

   D. DETERMINING ADDED INSURANCE NEEDS

   E. MAINTAINING BUILDINGS AND EQUIPMENT

   F. REPAIRING TACK

4. PLANNING AND DEVELOPING RIDING AND HIKING TRAILS

   A. DETERMINING THE LOCATION OF THE TRAIL

      (1) EVALUATING SCENERY
      (2) DETERMINING GRADE
      (3) DETERMINING LENGTH

   B. MARKING AND CLEARING TRAILS

   C. DEVELOPING BRIDGES

   D. DEVELOPING REST AREAS

   E. MAINTAINING RIDING AND HIKING TRAILS

      (1) MAINTAINING SIGNS
      (2) MAINTAINING REST AREA FACILITIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS DEVELOP A BULLETIN BOARD DISPLAY CONTAINING PICTURES OF BREEDS OF HORSES COMMONLY USED IN HORSEBACK RIDING ENTERPRISES.

2. HAVE A FARRIER (BLACKSMITH) AS A RESOURCE PERSON TO ASSIST STUDENTS IN LEARNING BASIC SKILLS.

3. VISIT RIDING STABLES TO OBSERVE BUILDING, FACILITY AND TACK NEEDS FOR HORSEBACK RIDING ENTERPRISES.

4. VISIT RIDING STABLES AND DISCUSS OPERATION AND MAINTENANCE TECHNIQUES WITH OPERATORS.

5. DEVELOP A RIDING OR HIKING TRAIL ON THE SCHOOL LAND LABORATORY WITH SPECIAL INTEREST STATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THREE HORSE BREEDS USED IN HORSEBACK RIDING ENTERPRISES AND EXPLAIN THE CHARACTERISTICS OF HORSES IN EACH BREED.

2. HAVE THE STUDENTS DEVELOP A LIST OF BUILDINGS, FACILITIES AND EQUIPMENT THAT WOULD BE NEEDED FOR A SPECIFIED HORSEBACK RIDING ENTERPRISE AND INDICATE THE TOTAL INVESTMENT COST THAT WOULD BE REQUIRED FOR THEM.

3. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO PROPERLY GROOM A HORSE FOR EVALUATION BY THE INSTRUCTOR.

4. HAVE EACH STUDENT PLAN A PUBLIC RELATIONS PROGRAM FOR A HYPOTHETICAL ENTERPRISE. THE PLAN SHOULD INCLUDE USES THAT WOULD BE MADE OF BILLBOARDS, BROCHURES, NEWSPAPERS AND OTHER MASS MEDIA.

5. IN AN ASSIGNED LAND AREA, HAVE EACH STUDENT INDICATE ON A TOPOGRAPHIC MAP, A RIDING AND/OR HIKING TRAIL WHICH MAKES GOOD USE OF SCENIC VIEWS, GRADES AND REST AREAS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HAND TOOLS FOR TRAIL CLEARING AND MARKING

2. FARRIER TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMITH, CLODUS R. RURAL RECREATION FOR PROFIT. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, 319 PAGES.

THIS TEXT CONTAINS INFORMATION CONCERNING OUTDOOR RECREATION ENTERPRISE DEVELOPMENT, MANAGEMENT AND ADMINISTRATION.

SHOOTING PRESERVE ESTABLISHMENT, MANAGEMENT AND MAINTENANCE

UNIT CONCEPT: WITH THE DECLINE IN AVAILABILITY OF PUBLIC AND PRIVATE HUNTING LANDS, SHOOTING PRESERVE ENTERPRISES HAVE INCREASED IN POPULARITY. A WORKING KNOWLEDGE OF SHOOTING PRESERVE MANAGEMENT AND OPERATION TECHNIQUES IS ESSENTIAL TO POTENTIAL ENTERPRISE EMPLOYEES AND OWNER/OPERATORS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN SHOWN SLIDES, PICTURES OR SPECIMENS OF WILDLIFE COMMONLY USED ON SHOOTING PRESERVES IN HIS REGION, IDENTIFY THE SPECIES AND EXPLAIN THE MAJOR CHARACTERISTICS USED TO IDENTIFY THE SPECIES WITH COMPLETE ACCURACY.

2. WHEN GIVEN THE INVENTORY DATA (SITE CHARACTERISTICS AND NATURAL RESOURCES) AND SOCIOECONOMIC FACTORS CONCERNING A SITE, SELECT THE TYPE OF PRESERVE THAT WOULD BE MOST FEASIBLE TO DEVELOP CONSIDERING THE CHARACTERISTICS OF PUBLIC AND PRIVATE PRESERVES.

3. WHEN GIVEN THE INVENTORY DATA AND CHARACTERISTICS OF A PARTICULAR SITE, SELECT THE WILDLIFE SPECIES TO USE WHICH WOULD FIT THE SITE AND THE AREA.

4. WHEN GIVEN THE SPECIES OF WILDLIFE AND SITE INVENTORY DATA, DEVELOP AND IMPLEMENT A PLAN FOR ESTABLISHING COVER FOR HOLDING AND HUNTING THE SPECIES IN ACCORDANCE WITH RECOMMENDATIONS BY THE SOIL CONSERVATION SERVICE AND GAME PRESERVE MANAGEMENT RESEARCH DATA.

5. WHEN GIVEN SELECTED SPECIES OF GAMEBIRDS, NATIVE GAME ANIMALS OR EXOTIC GAME ANIMALS, IDENTIFY AND IMPLEMENT THE SPECIAL MANAGEMENT PRACTICES NECESSARY TO PROVIDE HEALTHY, VIGOROUS SPECIMENS FOR HUNTING.

6. WHEN GIVEN A SPECIFIED SHOOTING PRESERVE, USE A BUDGET TO SELECT THE SUPPLEMENTARY ENTERPRISES AND SERVICES THAT COULD BE ESTABLISHED WHICH WOULD RESULT IN THE GREATEST NET RETURNS.

7. WHEN GIVEN A SPECIFIED SHOOTING PRESERVE, IDENTIFY THE MANAGEMENT FACTORS WHICH WILL RESULT IN MAXIMUM CUSTOMER SATISFACTION AND NET RETURNS.

8. IDENTIFY AND EXPLAIN ALL LOCAL, STATE, AND FEDERAL LAWS APPLICABLE TO SHOOTING PRESERVE MANAGEMENT WITH ACCURACY NECESSARY FOR LEGALLY OPERATING A PRESERVE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING WILDLIFE USED ON SHOOTING PRESERVES
   - A. IDENTIFYING GAMEBIRDS
   - B. IDENTIFYING NATIVE GAME ANIMALS
   - C. IDENTIFYING EXOTIC GAME ANIMALS
2. SELECTING THE TYPE OF ENTERPRISE
   - A. IDENTIFYING THE TYPES OF PRESERVES
   - B. DETERMINING LAND REQUIREMENTS
   - C. DETERMINING LAWS AND REGULATIONS
   - D. DETERMINING INVESTMENT COSTS
   - E. DETERMINING CUSTOMER DEMANDS
   - F. DETERMINING OWNER OBJECTIVES
3. SELECTING THE SPECIES OF WILDLIFE FOR A SHOOTING PRESERVE
   - A. IDENTIFYING SITE CHARACTERISTICS
   - B. DETERMINING CUSTOMER DEMANDS
   - C. IDENTIFYING MANAGEMENT FACTORS
   - D. DETERMINING OWNER OBJECTIVES
   - E. IDENTIFYING SOURCES OF WILDLIFE
4. ESTABLISHING WILDLIFE PRESERVE COVER
   - A. PROMOTING NATURAL SURROUNDINGS
   - B. DETERMINING BEST HOLDING COVER FOR SPECIES
   - C. DETERMINING BEST FLUSHING COVER FOR SPECIES

D. ESTABLISHING THE COVER

(1) SELECTING SEED
(2) OPERATING SEEDBED AND PLANTING EQUIPMENT
(3) IMPLEMENTING CULTURAL CONTROL
(4) OPERATING HARVESTING EQUIPMENT
(5) MAINTAINING EQUIPMENT

5. MANAGING WILDLIFE SPECIES

A. DEVELOPING FEED RATIONS AND SYSTEMS

B. DEVELOPING HOLDING PENS AND SHELTERS

C. PROVIDING FOR HEALTH AND SANITATION

D. BANDING AND TAGGING WILDLIFE

E. HANDLING GAMEBIRDS AND ANIMALS

6. SELECTING AND DEVELOPING SUPPLEMENTARY ENTERPRISES

A. MAKING A BUDGET

B. DEVELOPING GUIDE SERVICES

C. DEVELOPING RENTALS FOR HORSES, DOGS AND EQUIPMENT

(1) CARING FOR HORSES
(2) CARING FOR HUNTING DOGS
(3) TRAINING HUNTING DOGS
(4) MAINTAINING EQUIPMENT

D. DRESSING GAME

E. PROVIDING LODGING, MEALS, AND CONCESSIONS

F. DEVELOPING SHOOTING AND ARCHERY RANGES

G. DEVELOPING OFF-SEASON ENTERPRISES

7. DEVELOPING PRESERVE MANAGEMENT PRACTICES

A. DEVELOPING PERSONNEL

B. DETERMINING HUNTING RULES AND SAFETY PRACTICES

C. SETTING AND COLLECTING FEES

D. DEVELOPING ADMINISTRATIVE SKILLS

E. DEVELOPING NATURAL HUNTING CONDITIONS

(F) SCHEDULING HUNTS

8. IDENTIFYING STATE AND FEDERAL LAWS AND REGULATIONS

A. DETERMINING LICENSE REQUIREMENTS FOR ENTERPRISES AND HUNTERS

B. DETERMINING SEASONS

C. DETERMINING WILDLIFE REPLACEMENT REQUIREMENTS

D. IDENTIFYING BANDING AND TAGGING LAWS

E. IDENTIFYING GAME TRANSPORTATION LAWS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. PURCHASE OR TAKE SLIDES OF WILDLIFE SPECIES COMMONLY USED ON SHOOTING PRESERVES IN DIFFERENT STAGES OF GROWTH FOR IDENTIFICATION PRACTICE.

2. VISIT PUBLIC AND PRIVATE SHOOTING PRESERVE ENTERPRISES TO OBSERVE SITE AND MANAGEMENT REQUIREMENTS FOR DEVELOPING A PRESERVE.

3. SELECT A SITE WHICH COULD BE USED FOR A PRESERVE AND MAKE AN INVENTORY OF THE RESOURCES AND AREA TO DETERMINE WHAT GAME SPECIES WOULD BE MOST LIKELY TO BE SUCCESSFUL ON THE SITE.

4. PLAN AND DEVELOP A SHOOTING FIELD ON THE SCHOOL LAND LABORATORY TO GAIN EXPERIENCE IN DEVELOPING COVER AND TO OBSERVE THE FEATURES OF EACH TYPE OF COVER.

5. VISIT A GAME PROPAGATION OPERATION TO OBSERVE FEEDING, HEALTH, AND MANAGEMENT PRACTICES USED TO KEEP WILDLIFE HEALTHY AND VIGOROUS.

6. A. OBTAIN STATISTICS FROM A DEVELOPED PRESERVE AND USE TO DEVELOP BUDGETS FOR SUPPLEMENTARY ENTERPRISES.

B. DEVELOP A SKEET, TRAP, RIFLE AND/OR ARCHERY RANGE ON THE SCHOOL LAND LABORATORY.

C. HAVE EACH STUDENT LEARN GAME DRESSING TECHNIQUES THROUGH THE USE OF AN EXPERIENCED PRESERVE EMPLOYEE AS A RESOURCE PERSON.

7. HAVE THE OPERATOR OF A SUCCESSFUL PRESERVE DISCUSS WITH THE STUDENTS THE IMPORTANT MANAGEMENT FACTORS WHICH LEAD TO ENTERPRISE SUCCESS.

8. HAVE THE COUNTY OR AREA GAME PROTECTOR DISCUSS FEDERAL AND STATE LAWS APPLICABLE TO SHOOTING PRESERVE MANAGEMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A TEST BY USING SLIDES OF WILDLIFE SPECIES AND HAVING THE STUDENTS INDICATE THE SPECIES OR THEIR CHARACTERISTICS.

2. HAVE THE STUDENTS WRITE THE FACTORS THEY WOULD CONSIDER WHEN SELECTING THE TYPE OF SHOOTING ENTERPRISE TO DEVELOP ON AN AREA.

3. GIVE THE STUDENTS A HYPOTHETICAL SITE FOR A SHOOTING PRESERVE AND HAVE EACH WRITE THE SPECIES OF WILDLIFE THEY WOULD USE ON THE SITE, THE SPECIES CHARACTERISTICS AND THEIR MANAGEMENT NEEDS.

4. WHEN GIVEN THE SITE AND WILDLIFE SPECIES, HAVE EACH STUDENT DEVELOP FOR EVALUATION A PLAN FOR ESTABLISHING FLUSHING AND HOLDING COVER FOR A SHOOTING FIELD.

5. DEVELOP A MATCHING EXAM USING WILDLIFE SPECIES AND THE SPECIAL MANAGEMENT PRACTICES THAT ARE USED WITH EACH.

6. GIVE THE STUDENTS THE NECESSARY HYPOTHETICAL DATA FROM A SHOOTING PRESERVE FOR EACH OF THEM TO DEVELOP A BUDGET WHICH WILL INCLUDE COSTS AND NET RETURNS FOR THE MAJOR ENTERPRISE AND FOR SUPPLEMENTAL ENTERPRISES.

7. HAVE EACH STUDENT DEVELOP A LIST OF THE MANAGEMENT FACTORS WHICH WOULD BE IMPORTANT FOR SUCCESSFUL OPERATION OF AN ENTERPRISE.

8. GIVE THE STUDENTS A HYPOTHETICAL SHOOTING PRESERVE WITH SPECIFIC WILDLIFE SPECIES AND HAVE THEM INDICATE THE STATE AND FEDERAL LAWS WHICH WOULD APPLY TO THE PRESERVE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. INCUBATOR-BROODER COMBINATION (100 CHICK)

2. HAND TOOLS FOR SHOOTING RANGE DEVELOPMENT

3. COMMON FARM IMPLEMENTS FOR COVER DEVELOPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. SHOOTING PRESERVE MANAGEMENT --- THE NILO SYSTEM. EAST ALTON, ILLINOIS: WINCHESTER WESTERN DIVISION, OLIN MATHIESON CHEMICAL CORPORATION. 311 PAGES.

   THIS IS AN EXCELLENT REFERENCE FOR THE TEACHER AND STUDENT. SPECIFIC MANAGEMENT TECHNIQUES FOR DEVELOPMENT OF PRESERVES USING UPLAND GAMEBIRDS AND WATERFOWL ARE GIVEN.

GOLF COURSE MAINTENANCE

UNIT CONCEPT: EFFECTIVE MAINTENANCE PROGRAMS FOR GOLF COURSES WHICH INCLUDE PROPER SEEDING, FERTILITY MANAGEMENT, THATCHING, MOWING AND INSECT AND DISEASE CONTROL WILL CONTRIBUTE TO THE ENTERPRISE SUCCESS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN AN ESTABLISHED TURF, IDENTIFY THE COMMON TURFGRASSES GROWING IN THE AREA.

2. WHEN GIVEN A ROUGH GRADED AND DRAINED TURF AREA, PREPARE THE SOIL SURFACE USING SMALL ENGINE POWERED OR TRACTOR-DRIVEN TILLAGE EQUIPMENT SO THAT A DESIRABLE SEEDBED IS PRODUCED.

3. TAKE A REPRESENTATIVE SOIL SAMPLE OF AN AREA AND PREPARE THE SAMPLE FOR ANALYSIS BY A RECOGNIZED SOIL TESTING LABORATORY.

4. APPLY LIME AND FERTILIZER AND INCORPORATE THEM INTO THE SOIL USING APPROPRIATE TILLAGE EQUIPMENT AS RECOMMENDED BY SOIL TEST RESULTS.

5. WHEN GIVEN A PREPARED SEEDBED, DEMONSTRATE PROPER SEEDING OR STOLONIZING PROCEDURES FOR ESTABLISHING A PRODUCTIVE AND MANAGEABLE TURF.

6. WHEN GIVEN A PREPARED SEEDBED, DEMONSTRATE THE PROPER PROCEDURE FOR TRANSPLANTING SOD SO THAT DEAD SPOTS ARE MINIMIZED.

7. DEMONSTRATE THE PROPER METHOD OF MULCHING A NEWLY SEEDED TURF AREA USING COMMONLY USED MULCHING MATERIAL ACCORDING TO RECOMMENDATIONS FOR THE SPECIFIC TURFGRASS SPECIES.

8. WHEN GIVEN AN OLD TURF THAT CAN BE RENOVATED, DEMONSTRATE THE PROCEDURES NECESSARY TO CORRECT THE POOR CONDITIONS IN THE TURF.

9. WHEN GIVEN VARIOUS TYPES OF MOWING EQUIPMENT, PROPERLY

ADJUST THE EQUIPMENT FOR CUTTING HEIGHT ACCORDING TO THE TYPE OF TURF AREA BEING MOWED.

10. WHEN GIVEN PROPERLY ADJUSTED MOWING, AERATING AND THATCHING EQUIPMENT, PROPERLY OPERATE THE EQUIPMENT ACCORDING TO THE OPERATORS' MANUALS.

11. WHEN GIVEN TURF COMMON TO THE AREA DAMAGED BY WEEDS, DISEASE, INSECTS OR OTHER PESTS, IDENTIFY THE SOURCE OF THE DAMAGE ON SIGHT OR BY USING A RECOGNIZED REFERENCE.

12. WHEN GIVEN CHEMICAL WEED, DISEASE OR INSECT CONTROL RECOMMENDATIONS AND SPRAYING EQUIPMENT, PROPERLY CALIBRATE THE SPRAYER, SAFELY OPERATE IT AND, FOLLOWING USE, CLEAN THE EQUIPMENT FOR STORAGE AS INDICATED IN THE OPERATOR'S MANUAL.

13. WHEN GIVEN PROPER WATERING EQUIPMENT AND WATERING RECOMMENDATIONS FOR A TURF, OPERATE AND MAINTAIN THE WATERING EQUIPMENT AS NEEDED TO SUPPLY THE MOISTURE NEEDS OF THE AREA.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING COMMON TURFGRASS SPECIES

   A. IDENTIFYING SPECIE CHARACTERISTICS

   B. IDENTIFYING GROWTH CHARACTERISTICS

   C. IDENTIFYING USE CHARACTERISTICS

2. PREPARING A SEEDBED FOR RESEEDING

   A. PROVIDING ADEQUATE DRAINAGE

   B. SURFACE GRADING

   C. TILLING THE SOIL

   D. STERILIZING THE SOIL

   E. INCORPORATING LIME AND FERTILIZER ACCORDING TO RECOMMENDATIONS

   F. OPERATING AND MAINTAINING TILLAGE EQUIPMENT

3. ESTABLISHING TURF BY SEEDING

   A. OBTAINING PROPER SEED DISTRIBUTION

B. COVERING THE SEED

C. MULCHING THE SEEDED AREA

D. ROLLING THE MULCHED AREA

E. WATERING THE NEWLY SEEDED AREA

F. OPERATING AND MAINTAINING SEEDING AND MULCHING EQUIPMENT

4. ESTABLISHING TURF VEGETATIVELY

A. SODDING

(1) LIFTING SOD FOR TRANSPLANTING
(2) LAYING SOD

B. STOLONIZING

(1) USING MACHINE DISTRIBUTION METHODS
(2) HYDROSTOLONIZING
(3) ROLLING AND TOPDRESSING SOIL-PLANTED STOLONS

C. OPERATING AND MAINTAINING SODDING AND STOLONIZING EQUIPMENT

5. RENOVATING OLD TURF AREAS

A. DETERMINING THE CAUSE OF POOR CONDITION

B. USING RENOVATING PROCESSES

(1) REMOVING THATCH
(2) USING AN AERATOR
(3) APPLYING LIME AND FERTILIZER
(4) APPLYING PESTICIDES
(5) RESEEDING
(6) CORRECTING MOISTURE PROBLEMS

6. TAKING A REPRESENTATIVE SOIL SAMPLE

A. TAKING SOIL CORES

B. PREPARING THE SAMPLE FOR ANALYSIS

C. FILLING OUT FORMS FOR TESTING LABORATORY

D. INTERPRETING SOIL TEST RESULTS

7. APPLYING FERTILIZER AND LIME TO TURF AREAS

A. IDENTIFYING METHODS OF APPLICATION AND EFFECTIVENESS

B. CALIBRATING SPREADERS

C. OPERATING THE EQUIPMENT

D. CLEANING AND MAINTAINING THE EQUIPMENT

8. ADJUSTING AND OPERATING MOWING EQUIPMENT

A. IDENTIFYING SAFETY PRACTICES

B. ADJUSTING MOWING EQUIPMENT

C. IDENTIFYING MOWING TECHNIQUES

D. MAINTAINING MOWING EQUIPMENT

9. ADJUSTING AND OPERATING THATCHING AND AERATING EQUIPMENT

A. IDENTIFYING BENEFITS OF THATCHING AND AERATING TURF

B. ADJUSTING THE EQUIPMENT

C. OPERATING AND MAINTAINING THE EQUIPMENT

10. IDENTIFYING CAUSES OF TURF DAMAGE

A. IDENTIFYING COMMON TURF WEEDS

B. IDENTIFYING SYMPTOMS OF COMMON TURF DISEASES

C. IDENTIFYING COMMON TURF INSECTS OR SYMPTOMS OF INSECT DAMAGE

D. IDENTIFYING COMMON PESTS OR SYMPTOMS OF PEST DAMAGE

11. CONTROLLING WEEDS, DISEASE, INSECTS AND PESTS

A. USING CULTURAL METHODS TO CONTROL TURF PROBLEMS

B. USING DIFFERENT METHODS OF APPLYING CHEMICALS

C. CALIBRATING HIGH AND LOW VOLUME SPRAYERS

D. CALIBRATING HERBICIDE EQUIPMENT

E. IDENTIFYING SAFETY PRECAUTIONS WHEN USING CHEMICALS

12. WATERING TURF AREAS

A. CONTROLLING THE AMOUNT OF WATER APPLIED

B. MAINTAINING WATERING AND/OR IRRIGATION EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. VISIT A GOLF COURSE TO SEE THE TYPES OF TURF NEEDED FOR SPECIFIC AREAS AND HAVE THE STUDENTS IDENTIFY THE CONDITIONS THAT TURFGRASSES IN THESE AREAS MUST MEET.

   B. USING SEED SAMPLES AND SAMPLES OF GROWING TURFGRASSES, HAVE STUDENTS IDENTIFY THE SPECIES BY COMMON NAME AND GIVE A TURF AREA WHERE THE VARIETY MAY BE USED.

2. VISIT A GOLF COURSE UNDER CONSTRUCTION TO OBSERVE ROUGH GRADING, DRAINAGE PRACTICES AND SEEDBED PREPARATION.

3. HAVE STUDENTS TAKE REPRESENTATIVE SOIL SAMPLES FROM THE SCHOOL GROUNDS OR FROM LOCAL RESIDENTS' LAWNS FOR TESTING.

4. HAVE STUDENTS APPLY LIME AND FERTILIZERS TO A GIVEN TURF AREA ACCORDING TO TEST RESULTS.

5. HAVE STUDENTS ESTABLISH A TURF AREA OR OBSERVE THE ESTABLISHMENT OF A TURF AREA BY STOLONIZING.

6. VISIT A SOD NURSERY TO OBSERVE A SOD-LIFTING OPERATION.

7. DEVELOP A DISPLAY OF THE DIFFERENT TYPES OF MULCHES USED ON TURFGRASS AREAS TO OBSERVE THE DIFFERENCES IN THEIR CHARACTERISTICS.

8. HAVE STUDENT RENOVATE TURF AREAS ON THE SCHOOL GROUNDS THAT ARE IN POOR CONDITION.

9. HAVE STUDENTS PRACTICE ADJUSTING THE DIFFERENT TYPES OF MOWERS FOUND AT A GOLF COURSE UNDER THE SUPERVISION OF THE TEACHER AND GOLF COURSE EMPLOYEES.

10. ASSIGN STUDENTS CERTAIN AREAS OF THE SCHOOL GROUNDS FOR THE DEVELOPMENT OF MOWING TECHNIQUES.

11. A. USING LIVE AND PRESERVED SPECIMENS OF WEEDS COMMON TO THE AREA AND APPROPRIATE REFERENCES, HAVE THE STUDENTS IDENTIFY THE WEEDS.

    B. HAVE THE STUDENTS CONTROL THE WEEDS, INSECTS AND DISEASES IN THE SCHOOL LAWN USING RECOMMENDED METHODS, EQUIPMENT AND CHEMICALS.

    C. STUDENTS SHOULD OBSERVE EXAMPLES OF TURFGRASS DISEASES IN THE LOCAL AREA AND DEVELOP A SLIDE SERIES SHOWING

SYMPTOMS OF THE DISEASES.

D. HAVE STUDENTS STUDY THE LIFE CYCLES OF COMMON INSECT PESTS FOUND IN TURF AREAS TO UNDERSTAND TIMING AND METHODS OF CONTROLLING INSECTS.

12. USING LABELS FROM PESTICIDE AND HERBICIDE CONTAINERS, HAVE STUDENTS DEVELOP A LIST OF SAFETY PRECAUTIONS WHICH SHOULD BE USED WHEN HANDLING CHEMICALS.

13. HAVE STUDENTS DISASSEMBLE WATER SPRINKLERS AND INSPECT THEM FOR DAMAGED WASHERS OR WORN PARTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING SPECIMENS OR SLIDES, DEVELOP A TURFGRASS SPECIES IDENTIFICATION TEST. THE STUDENTS SHOULD BE ABLE TO IDENTIFY AT LEAST 5 DIFFERENT TURFGRASS SPECIES.

2. HAVE THE STUDENTS DEVELOP A SEEDBED ON A ROUGH GRADED AND DRAINED AREA. EVALUATE THE STUDENTS ON CORRECTNESS OF TECHNIQUES, ABILITY TO OPERATE THE EQUIPMENT, AND THE CONDITION OF THE COMPLETED SEEDBED.

3. HAVE EACH STUDENT TAKE A REPRESENTATIVE SOIL SAMPLE FROM A TURFGRASS AREA, PREPARE IT FOR TESTING AND INTERPRET THE TEST RESULTS.

4. HAVE EACH STUDENT DEMONSTRATE THE ABILITY TO CALIBRATE SPREADERS AND APPLY LIME AND FERTILIZER WITH ACCURACY REQUIRED FOR WORK AS A GOLF COURSE GREENS WORKER OR EMPLOYEE.

5. HAVE EACH STUDENT CALIBRATE A LAWN SEEDER AS INDICATED IN THE OPERATOR'S MANUAL.

6. HAVE EACH STUDENT LIST THE STEPS IN SODDING AN AREA WHICH SHOULD INCLUDE PROCEDURES FOR SEEDBED PREPARATION, LIFTING THE SOD, LAYING THE SOD, ROLLING AND WATERING.

7. HAVE EACH STUDENT LIST THE DIFFERENT KINDS OF MULCHES USED ON NEWLY SEEDED AREAS AND INDICATE THEIR ADVANTAGES AND DISADVANTAGES.

8. HAVE THE STUDENTS RENOVATE ANY AREAS IN THE SCHOOL LAWN THAT ARE IN POOR CONDITION. EVALUATE THE STUDENTS AS TO CORRECTNESS OF PROCEDURE.

9. HAVE EACH STUDENT PROPERLY ADJUST THE HEIGHT OF MOWING EQUIPMENT AS INSTRUCTED IN THE OPERATORS' MANUALS.

10. HAVE EACH STUDENT OPERATE MOWING, AERATING AND THATCHING

EQUIPMENT. EVALUATE THE STUDENT ON HIS ABILITY AND OBSERVATION OF SAFETY PRACTICES.

11. HAVE THE STUDENTS IDENTIFY COMMON TURF WEEDS, TURF INSECTS, AND DISEASES AND THE CORRESPONDING DAMAGE THAT OCCURS IN INFESTED AREAS.

12. HAVE EACH STUDENT CALIBRATE A CHEMICAL SPRAYER ACCORDING TO INSTRUCTIONS IN THE OPERATOR'S MANUAL.

13. HAVE THE STUDENTS DETERMINE THE LENGTH OF TIME A GIVEN WATERING SYSTEM SHOULD BE IN OPERATION TO PROVIDE A SPECIFIED AMOUNT OF WATER TO A GIVEN TURF AREA.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. GRASS SEED SAMPLES
2. PLANT SPECIMENS (GRASSES, WEEDS)
3. RAKES, HOES, SHOVELS FOR SEEDBED PREPARATION
4. FERTILIZER BAG ANALYSIS LABELS
5. HAND LAWN SEEDERS
6. MULCHING MATERIALS
7. OPERATOR MANUALS FROM POWER EQUIPMENT
8. SOIL TEST RESULTS FROM TURF AREAS NEEDING RENOVATION
9. FERTILIZERS OF VARYING ANALYSES
10. FERTILIZER SPREADER
11. SPRAYER (HAND OR TRACTOR OPERATED)
12. SOIL TESTING MAILING KITS
13. HAND TOOLS FOR ADJUSTING EQUIPMENT
14. EXAMPLES OF TYPES OF IRRIGATION NOZZLES
15. HERBICIDE CONTAINER LABELS
16. CAMERA AND SLIDE PROJECTOR
17. SOIL PROBE

F. EXAMPLES OF SUPPORTING REFERENCES

1. TURF MANAGEMENT. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1973, 109 PAGES.

   A COMPREHENSIVE REFERENCE MANUAL WHICH INCLUDES MATERIAL ON SOIL, TURFGRASS SPECIES AND VARIETIES, PROPAGATION AND TURF MAINTENANCE INCLUDING PEST CONTROL.

2. TURFGRASS MAINTENANCE AND ESTABLISHMENT - A TEACHER'S MANUAL. UNIVERSITY PARK, PENNSYLVANIA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE PENNSYLVANIA STATE UNIVERSITY. 1968, 160 PAGES.

   MATERIAL COVERED IN THIS REFERENCE INCLUDES SOIL DRAINAGE, FERTILIZATION AND SEEDBED PREPARATION.

VI

RANGE
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RANGE PLANT ECOLOGY

RANGE PLANT IDENTIFICATION

RANGE CONDITION, TREND AND UTILIZATION

RANGE GRAZING MANAGEMENT

RANGE RENOVATION PRACTICES

RANGE PLANT ECOLOGY

UNIT CONCEPT: SUCCESSFUL MANAGEMENT OF RANGE LAND REQUIRES A KNOWLEDGE OF THE ENVIRONMENT IN WHICH A PLANT LIVES. ECOLOGICAL FACTORS AFFECTING PLANT GROWTH WILL HAVE A BEARING ON THE MANAGEMENT DECISIONS MADE REGARDING RANGE LANDS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. EXPLAIN THE CHARACTERISTICS OF THE FIVE BASIC CLIMATIC FACTORS AND HOW THEY AFFECT PLANT GROWTH WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.

2. EXPLAIN THE CHARACTERISTICS OF THE FOUR BASIC SOIL FACTORS AND HOW THEY AFFECT PLANT GROWTH WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.

3. IDENTIFY FIVE PLANT COMMUNITIES COMMON TO THEIR AREA.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING CLIMATIC FACTORS AFFECTING PLANT GROWTH AND DEVELOPMENT

   A. RAINFALL

   B. TEMPERATURE

   C. ALTITUDE

   D. WIND

   E. LIGHT

2. DETERMINING SOIL FACTORS THAT AFFECT PLANT GROWTH AND DEVELOPMENT

   A. EFFECTS OF SOIL TEXTURE

   B. EFFECTS OF SOIL PH

   C. EFFECTS OF SOIL DEPTH

D. EFFECTS OF SOIL STRUCTURE

3. RECOGNIZING PLANT COMMUNITIES

A. VISUAL DETERMINATION

B. PROCESS OF CHANGE

(1) PLANT SUCCESSION
(2) RETROGRESSION
(3) SECONDARY SUCCESSION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS OBSERVE AND TAKE NOTE OF THE CHARACTERISTICS OF PLANT COMMUNITIES AFFECTED BY THE CLIMATIC FACTORS DISCUSSED IN THE CONTENT.

2. A. HAVE STUDENTS TEST THE TOP SOIL DEPTH IN AREAS OF EXCELLENT AND POOR PLANT GROWTH AND, AT THE SAME TIME, OBSERVE SOIL STRUCTURE.

B. HAVE STUDENTS OBSERVE SAMPLES OF SOIL TEXTURES AND IDENTIFY SOIL TEXTURES USING SOIL ANALYSIS SIEVES.

C. HAVE STUDENTS TEST SOIL PH IN VARIOUS PLANT COMMUNITIES TO GAIN KNOWLEDGE OF THE TYPES OF PLANTS GROWING IN SOILS OF VARYING PH LEVELS.

3. HAVE STUDENTS LOCATE PLANT COMMUNITIES AND IDENTIFY THE TYPE OF COMMUNITIES PRESENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT IDENTIFY THE FIVE CLIMATIC FACTORS AFFECTING PLANT GROWTH AND DISCUSS HOW EACH FACTOR AFFECTS THE GROWTH.

2. HAVE EACH STUDENT TEST SOIL PH WITHIN ± .5 PH AND INDICATE IN WRITING HOW PH AFFECTS PLANT GROWTH.

3. GIVEN A PARTICULAR RANGE SITE, HAVE EACH STUDENT IDENTIFY THE PLANT COMMUNITIES PRESENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SOIL PH TESTING KIT

2. SHOVEL OR SPADE

3. SOIL ANALYSIS SIEVES

F. EXAMPLES OF SUPPORTING REFERENCES

1. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE AND STUDENT MANUAL. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 444 PAGES.

   THIS MATERIAL INCLUDES SPECIFIC AREAS COVERING THE CLIMATIC AND SOIL FACTORS WHICH AFFECT RANGE MANAGEMENT.

RANGE PLANT IDENTIFICATION

UNIT CONCEPT: AN IMPORTANT ASPECT OF RANGE MANAGEMENT IS THE ABILITY TO DETERMINE RANGE CONDITION. IN ORDER TO DETERMINE THE CONDITION OF A GIVEN RANGE, THE INDIVIDUAL MUST FIRST RECOGNIZE THE PLANT SPECIES GROWING ON THAT RANGE. THE ABILITY TO RECOGNIZE RANGE PLANTS IS AN ESSENTIAL TO MANY FACETS OF RANGE MANAGEMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN SHOWN EXAMPLES OF EACH, IDENTIFY WITH 100% ACCURACY THE FOUR TYPES OF RANGE PLANTS.

2. WHEN SHOWN A LIVE SAMPLE OF A GRASS PLANT, NAME AND POINT OUT ALL OF THE PARTS OF A GRASS PLANT WITH 100% ACCURACY.

3. USING A PLANT IDENTIFICATION KEY WHEN NECESSARY, IDENTIFY AND NAME THE GRASSLIKE PLANTS AND THE RANGE GRASS PLANTS OF THE WHEATGRASS, GRAMA, OATGRASS, FESCUE, REDTOP AND BLUESTEM TRIBES COMMON TO THE COMMUNITY WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.

4. USING A PLANT IDENTIFICATION KEY, IDENTIFY AND NAME FIVE RANGE FORBS COMMON TO THE COMMUNITY.

5. USING A PLANT IDENTIFICATION KEY, IDENTIFY AND NAME TEN RANGE SHRUBS COMMON TO THE COMMUNITY.

6. IDENTIFY AND NAME THE POISONOUS RANGE PLANTS COMMON TO THE COMMUNITY.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE TYPES OF RANGE PLANTS

   A. CHARACTERISTICS OF GRASSES

   B. CHARACTERISTICS OF GRASS-LIKE PLANTS

   C. CHARACTERISTICS OF FORBS

D. CHARACTERISTICS OF SHRUBS

2. RECOGNIZING PARTS OF THE GRASS PLANT

A. RECOGNIZING TYPES OF SEED HEADS

B. IDENTIFYING THE PARTS OF THE SEED HEAD

C. IDENTIFYING VEGETATIVE PARTS OF GRASS PLANTS

3. IDENTIFYING RANGE GRASSES OF THE SIX GRASS TRIBES

A. WHEATGRASS TRIBE

B. GRAMA TRIBE

C. OATGRASS TRIBE

D. FESCUE TRIBE

E. REDTOP TRIBE

F. BLUESTEM TRIBE

4. IDENTIFYING COMMON RANGE FORBS

5. IDENTIFY COMMON RANGE SHRUBS

6. IDENTIFYING COMMON POISONOUS PLANTS

7. USING PLANT IDENTIFICATION KEYS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS COLLECT AND IDENTIFY SPECIMENS OF GRASSES, FORBS, SHRUBS AND POISONOUS PLANTS COMMON IN THEIR AREA.

2. HAVE THE STUDENTS TAKE APART A GRASS SPECIMEN AND LABEL THE PARTS OF THE GRASS PLANT ON A DIAGRAM.

3. TAKE A FIELD TRIP TO SOME RANGE LAND AND HAVE THE STUDENTS OBSERVE AND STUDY PLANT MOUNTS AND/OR SLIDES OF RANGE FORBS TO AID THEM IN BECOMING COMPETENT IN THEIR IDENTIFICATION PROCESS.

5. HAVE THE STUDENTS USE A PLANT IDENTIFICATION KEY AND IDENTIFY THE RANGE SHRUBS IN A SPECIFIED RANGE AREA.

6. HAVE THE STUDENTS COLLECT AND DEVELOP A DISPLAY OF THE COMMON POISONOUS RANGE PLANTS FOUND IN THEIR AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DISTINGUISH BETWEEN GRASSES, GRASS-LIKE PLANTS, FORBS AND SHRUBS USING LIVE SPECIMENS, SLIDES OR MOUNTS.

2. HAVE EACH STUDENT IDENTIFY ALL PARTS OF A RANGE GRASS PLANT.

3. HAVE EACH STUDENT IDENTIFY COMMON RANGE GRASSES WITH 90% ACCURACY USING AN IDENTIFICATION KEY.

4. HAVE EACH STUDENT IDENTIFY COMMON RANGE FORBS WITH 90% ACCURACY USING AN IDENTIFICATION KEY.

5. HAVE EACH STUDENT IDENTIFY COMMON RANGE SHRUBS WITH 90% ACCURACY USING AN IDENTIFICATION KEY.

6. HAVE EACH STUDENT IDENTIFY COMMON POISONOUS RANGE PLANTS WITH 100% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PLANT IDENTIFICATION KEY (COMMON TO THE AREA)

2. RANGE PLANT MOUNTS

3. SLIDES OF COMMON RANGE PLANTS

4. PROJECTOR

F. EXAMPLES OF SUPPORTING REFERENCES

1. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

   THE UNIT OUTLINE CONTAINS PLANT IDENTIFICATION KEYS AS WELL AS COMPLETE GUIDES TO RECOGNITION OF COMMON POISONOUS PLANTS.

2. TIPS ON "GRASS" IDENTIFICATION USING VEGETATIVE CHARACTERISTICS. CIRCULAR 1089. BOZEMAN, MONTANA: COOPERATIVE EXTENSION SERVICE, MONTANA STATE UNIVERSITY. 1968.

   THIS PAMPHLET CONTAINS PROCEDURES FOR IDENTIFYING "GRASSES" USING THE CHARACTERISTICS OF THE VEGETATIVE PARTS.

RANGE CONDITION, TREND AND UTILIZATION

UNIT CONCEPT: SUCCESSFUL RANGE MANAGEMENT REQUIRES KNOWLEDGE OF THE PROCEDURES IN DETERMINING RANGE CONDITION, TREND AND UTILIZATION. AS AN INDIVIDUAL DETERMINES THESE FACTORS, HE IS ABLE TO USE THE INFORMATION IN MAKING MANAGEMENT DECISIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. PLACE RANGE PLANTS INTO THE PROPER GROUPING FOR RANGE CONDITION ANALYSIS WITH 90% ACCURACY.

2. USING THE SOIL CONSERVATION SERVICE RANGE CONDITION ANALYSIS METHOD, DETERMINE RANGE CONDITION ON A GIVEN SITE TO WITHIN ± 10% OF THE ACTUAL RANGE CONDITION SCORE.

3. UPON COMPLETION OF A RANGE CONDITION ANALYSIS, CLASSIFY RANGE LAND INTO THE PROPER CONDITION CLASSIFICATION WITH COMPLETE ACCURACY.

4. FIGURE THE STOCKING RATE FOR A GIVEN RANGE SITE WITH A GIVEN CONDITION TO WITHIN ± TWO ANIMAL UNITS FOR EACH 100 ACRES ON THE SITE.

5. DETERMINE RANGE TREND ON A GIVEN SITE TO WITHIN ± 10% OF THE DESIRABLE PLANTS AVAILABLE.

6. ANALYZE THE PROPER RANGE UTILIZATION ON A GIVEN SITE TO WITHIN ± 10% OF THE ACTUAL AMOUNT OF FORAGE GRAZED.

B. INSTRUCTIONAL AREAS

1. GROUPING PLANTS FOR RANGE CONDITION ANALYSIS

   A. DECREASER PLANTS

   B. INCREASER PLANTS

   C. INVADER PLANTS

2. DETERMINING RANGE CONDITION USING THE SOIL CONSERVATION SERVICE RANGE CONDITION ANALYSIS METHOD

3. CLASSIFYING RANGE CONDITION BASED ON PERCENTAGE OF FORAGE PRODUCED ON CLIMAX VEGETATION

   A. EXCELLENT: 75 TO 100 PERCENT

   B. GOOD: 50 TO 75 PERCENT

   C. FAIR: 25 TO 50 PERCENT

   D. POOR: 0 TO 15 PERCENT

4. FIGURING STOCKING RATES

5. DETERMINING RANGE TREND

   A. VISUAL EXAMINATION

   B. PACE TRANSECT METHOD

   C. PARKER THREE-STEP METHOD

6. ANALYZING PROPER RANGE UTILIZATION

   A. KEY SPECIES CONCEPT

   B. EYEBALL METHOD

   C. PHOTOGRAPHY METHOD

   D. OCCULAR PLOT ESTIMATE

   E. ENCLOSURES METHODS

   F. COMPARISON METHODS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. GIVE THE STUDENTS A LIST OF 25 PLANTS AND HAVE THEM GROUP THEM INTO THE PROPER GROUPING FOR RANGE CONDITION ANALYSIS.

2. A. HAVE THE STUDENTS DETERMINE RANGE CONDITION IN THE CLASSROOM USING HYPOTHETICAL PLANT DATA AND THE SOIL CONSERVATION SERVICE TECHNICIAN GUIDES.

   B. HAVE THE STUDENTS DETERMINE THE RANGE CONDITION ON THREE DIFFERENT RANGE SITES USING THE APPROPRIATE SOIL CONSERVATION SERVICE TECHNICIAN GUIDES.

3. GIVE THE STUDENTS 10 RANGE CONDITION PERCENTAGES AND HAVE THE STUDENTS CLASSIFY THE PERCENTAGES INTO THE PROPER CONDITION CLASSIFICATION.

4. A. HAVE THE STUDENTS FIGURE STOCKING RATES IN THE CLASSROOM USING HYPOTHETICAL RANGE DATA.

   B. HAVE THE STUDENTS FIGURE STOCKING RATES FOR THE RANGE SITES IN WHICH THEY HAVE DETERMINED CONDITIONS.

5. HAVE THE STUDENTS DEVELOP A RANGE STOCKING PLAN FOR RANGELAND THAT IS IN AN UPWARD AND/OR DOWNWARD TREND.

6. HAVE THE STUDENTS DETERMINE THE RANGE UTILIZATION ON THREE DIFFERENT RANGE SITES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT GROUP RANGE PLANTS INTO THE PROPER GROUPING FOR RANGE CONDITION ANALYSIS.

2. HAVE THE STUDENTS DETERMINE RANGE CONDITION ON A GIVEN SITE USING THE SOIL CONSERVATION RANGE CONDITION ANALYSIS METHOD.

3. HAVE EACH STUDENT CLASSIFY 10 DIFFERENT RANGE CONDITION PERCENTAGES INTO THE PROPER CONDITION CLASSIFICATION.

4. HAVE EACH STUDENT FIGURE THE PROPER STOCKING RATE FOR A GIVEN RANGE CONDITION WITHIN ± 2 ANIMAL UNITS PER 100 ACRES.

5. HAVE EACH STUDENT DETERMINE RANGE TREND ON A SITE SPECIFIED BY THE INSTRUCTOR TO WITHIN ± 10% OF THE DESIRABLE PLANTS AVAILABLE.

6. HAVE EACH STUDENT ANALYZE THE PROPER RANGE UTILIZATION ON A GIVEN SITE TO WITHIN ± 10% OF THE ACTUAL AMOUNT OF FORAGE GRAZED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. TECHNICIANS' GUIDE. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE, U.S. GOVERN-

MENT PRINTING OFFICE.

THIS GUIDE CONTAINS INFORMATION CONCERNING THE SOIL CONSERVATION SERVICE RANGE CONDITION ANALYSIS METHOD.

2. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

UNIT SIX OF THIS PUBLICATION COVERS RANGE CONDITIONS, TREND AND UTILIZATION.

RANGE GRAZING MANAGEMENT

UNIT CONCEPT: SUCCESSFUL RANGE MANAGEMENT REQUIRES A KNOWLEDGE OF GRAZING SYSTEMS AND THE PROPER MANAGEMENT OF GRAZING LANDS. A GRAZING PLAN IS NECESSARY TO MAINTAIN QUALITY RANGELANDS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE PROPER GRAZING SEASON ACCORDING TO THE STAGE OF PLANT GROWTH WITH ACCURACY OF ± TWO WEEKS.
2. SELECT THE PROPER MEANS OF DISTRIBUTING GRAZING TO OBTAIN MAXIMUM USE OF ALL AVAILABLE RANGE LAND.
3. ADJUST GRAZING OPERATIONS ON A GIVEN RANGE SITE ACCORDING TO THE AMOUNT OF FORAGE PRODUCTION TO WITHIN ± TWO ANIMAL UNITS FOR EACH 100 ACRES ON THE SITE.
4. DETECT RANGE MISUSE AND ADJUST GRAZING TO WITHIN ± TWO ANIMAL UNITS FOR EACH 100 ACRES ON THE SITE.
5. SELECT A GRAZING SYSTEM AND DEVELOP A GRAZING PLAN FOR THE SYSTEM THAT WOULD BE FEASIBLE ACCORDING TO SPECIFICATIONS DESIGNATED BY THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE PROPER GRAZING SEASON
   - A. RANGE READINESS
   - B. SOIL READINESS
2. DISTRIBUTING GRAZING
   - A. SALTING
   - B. FENCING
   - C. HERDING
   - D. TRAIL BUILDING

E. DEVELOPING WATER AREAS

F. SELECTING PROPER CLASS OF LIVESTOCK

3. ADJUSTING GRAZING OPERATIONS TO FORAGE PRODUCTION

A. DECREASING THE HERD

B. INCREASING THE HERD

4. DETECTING RANGE MISUSE

A. BEST FORAGE PLANTS DECREASING

B. SOIL DISTURBANCE OR EROSION

C. CONDITION OF THE LIVESTOCK

5. SELECTING GRAZING SYSTEMS

A. CONTINUOUS GRAZING

B. DEFERRED GRAZING

C. ROTATION GRAZING

D. DEFERRED-ROTATION GRAZING

E. REST-ROTATION GRAZING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS MAKE A LIST OF COMMON RANGE PLANTS AND INDICATE THE MINIMUM STAGE OF PLANT GROWTH NECESSARY BEFORE GRAZING MAY BEGIN ON SUCH GRASSES.

2. HAVE SOIL CONSERVATION SERVICE PERSONNEL AS RESOURCE PERSONS TO DISCUSS GRAZING SYSTEMS.

3. A. HAVE STUDENTS DEVELOP A STOCKING PLAN FOR RANGE LAND THAT HAS AN INCREASING AMOUNT OF FORAGE ON IT.

   B. HAVE STUDENTS DEVELOP A STOCKING PLAN FOR RANGE LAND THAT HAS A DECREASING AMOUNT OF AVAILABLE FORAGE.

4. HAVE STUDENTS OBSERVE HEAVILY GRAZED RANGE AND DEVELOP A PLAN FOR DISTRIBUTING GRAZING ON THE RANGE.

5. HAVE STUDENTS DEVELOP A GRAZING PLAN FOR EACH OF THE GRAZING SYSTEMS DISCUSSED IN THE CONTENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. ON A SPECIFIED SITE, HAVE EACH STUDENT IDENTIFY WHEN THE RANGE CAN BE SAFELY GRAZED ACCORDING TO THE STAGE OF PLANT GROWTH.

2. HAVE EACH STUDENT SELECT THE PROPER MEANS OF DISTRIBUTING GRAZING ON A SPECIFIED SITE.

3. HAVE EACH STUDENT DETERMINE THE NECESSARY ADJUSTMENT OF GRAZING OPERATIONS ACCORDING TO THE AMOUNT OF AVAILABLE FORAGE ON A SPECIFIED SITE.

4. HAVE EACH STUDENT LIST THE FACTORS WHICH SHOULD BE CONSIDERED IN DETERMINING RANGE MISUSE.

5. HAVE EACH STUDENT SELECT THE GRAZING SYSTEM MOST SUITABLE TO A GIVEN SITUATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. HOUSTON, W. R. EFFECTS OF STOCKING RATES ON RANGE VEGETATION AND BEEF CATTLE PRODUCTION ON THE NORTHERN GREAT PLAINS. TECHNICAL BULLETIN NO. 1357. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1966.

   THIS BULLETIN COVERS STOCKING RATES AND THEIR RESULTANT EFFECTS ON RANGE VEGETATION.

2. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

   UNIT SEVEN OF THIS PUBLICATION COVERS GRAZING SYSTEMS AND PRACTICES.

RANGE RENOVATION PRACTICES

UNIT CONCEPT: IF RANGE LAND HAS BEEN IMPROPERLY MANAGED OVER A LONG PERIOD OF TIME, THE CONDITION OF THE RANGE CAN BECOME SO POOR THAT RENOVATION BECOMES NECESSARY. IT IS ESSENTIAL TO BE ABLE TO SELECT AND USE THE PROPER RENOVATION PRACTICES TO RESTORE SUCH RANGE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A PARTICULAR SITUATION, DETERMINE THE FEASIBILITY OF RANGE RENOVATION TO THE DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.

2. IDENTIFY THE FOUR STEPS OF THE RANGE RENOVATION PROCESS WITH COMPLETE ACCURACY.

3. SELECT THE PROPER RENOVATION PRACTICE FOR A GIVEN SITUATION WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.

4. DETERMINE THE COST OF RENOVATION PRACTICES WITHIN ± $2.00 PER ACRE.

5. IDENTIFY STATE AND FEDERAL AGENCIES FROM WHICH HELP CAN BE OBTAINED TO MAKE MANAGEMENT DECISIONS AND/OR FINANCIAL ASSISTANCE CAN BE SECURED.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE FEASIBILITY OF RANGE RENOVATION

   A. RANGE CONDITION

   B. TYPE OF SOIL

   C. SLOPE OF THE LAND

   D. SIZE OF AREA TO BE CONSIDERED FOR TREATMENT

   E. COST OF THE TREATMENT

   F. AVAILABILITY OF EQUIPMENT

G. USE OF AREA BY WILDLIFE

H. OTHER USES

2. IDENTIFYING THE STEPS IN THE RANGE RENOVATION PROCESS

A. FINDING THE CAUSE OF RANGE RETROGRESSION

B. DECIDING WHICH RENOVATION PRACTICE IS BEST SUITED FOR THE SITUATION

C. COMPLETING THE RENOVATION PROCESS

D. MAINTAINING PROPER RANGE MANAGEMENT PRACTICES

3. SELECTING RENOVATION PRACTICES

A. SPRAYING

B. PITTING AND INTERSEEDING

C. DEFERRED GRAZING

D. CROSSFENCING

E. FERTILIZING

F. BURNING

4. DETERMINING COST OF RENOVATION

A. MAKING A BUDGET

B. ANALYZING COSTS

5. IDENTIFYING STATE AND FEDERAL AGENCIES FOR ASSISTANCE

A. AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE

B. SOIL CONSERVATION SERVICE

C. FOREST SERVICE

D. BUREAU OF LAND MANAGEMENT

E. BUREAU OF INDIAN AFFAIRS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS DETERMINE THE FEASIBILITY OF RENOVATING A GIVEN RANGE SITE.

2. HAVE A RESOURCE PERSON FROM THE SOIL CONSERVATION SERVICE OR OTHER GOVERNMENTAL AGENCY DISCUSS WITH THE STUDENTS THE RANGE RENOVATION PROCESS.

3. HAVE STUDENTS DEVELOP A PLAN FOR RENOVATING A GIVEN RANGE SITE.

4. HAVE STUDENTS FIGURE THE COST OF USING EACH RANGE RENOVATION PRACTICE ON A RANGE TRACT OF 320 ACRES.

5. HAVE AS RESOURCE PERSONS REPRESENTATIVES FROM VARIOUS GOVERNMENTAL AGENCIES TO EXPLAIN THEIR ROLE IN RANGE MANAGEMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DETERMINE THE FEASIBILITY OF RENOVATING A GIVEN RANGE LAND AREA.

2. HAVE EACH STUDENT IDENTIFY AND DESCRIBE THE FOUR STEPS OR THE RANGE RENOVATION PROCESS.

3. HAVE EACH STUDENT SELECT THE PROPER RANGE RENOVATION PRACTICE FOR A GIVEN SITE AS DETERMINED BY A REPRESENTATIVE OF THE SOIL CONSERVATION SERVICE.

4. HAVE EACH STUDENT DETERMINE THE COST PER ACRE OF EACH RANGE RENOVATION PRACTICE TO BE USED ON A SPECIFIED RANGE SITE.

5. HAVE EACH STUDENT IDENTIFY AND EXPLAIN THE SERVICES PROVIDED BY THE STATE AND FEDERAL AGENCIES THAT ASSIST IN MANAGING RANGELANDS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

   UNIT EIGHT IN THIS PUBLICATION COVERS THOSE AREAS OF RANGE RENOVATION CONSIDERED IN THIS UNIT.

VII

SOIL

U.S.O.E. CODE 01.06 03 00 00

SOIL FORMATION AND PROPERTIES

LAND USE CLASSIFICATION AND CONSERVATION PRACTICES

SOIL FERTILITY MANAGEMENT

MAP INTERPRETATION AND USE

LAND MEASUREMENT

ELEMENTARY SURVEYING

SOIL FORMATION AND PROPERTIES

UNIT CONCEPT: BACKGROUND KNOWLEDGE IN SOIL FORMATION AND SOIL PROPERTIES WILL PROVIDE A BASIS FOR DECISIONS CONCERNING SOIL CONSERVATION AND MANAGEMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING THE FIVE BASIC SOIL FORMING FACTORS, DETERMINE THE SOIL-FORMING PROCESSES THAT ARE PREVALENT IN HIS STATE OR REGION.

2. THROUGH MECHANICAL ANALYSIS, DETERMINE THE MAJOR PHYSICAL PROPERTIES OF THE SOIL AS WOULD BE REQUIRED FOR WORK AS A SOIL CONSERVATION AIDE.

3. DETERMINE THE CHEMICAL PROPERTIES OF THE SOIL WHICH RELATE TO FERTILITY WITH ACCURACY REQUIRED OF A SOIL CONSERVATION AIDE.

4. IDENTIFY THE MAJOR BIOLOGICAL FACTORS (SOIL, ANIMALS AND PLANTS) IN THE SOIL AND LIST SIX WAYS IN WHICH THEY AFFECT IT.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE METHODS OF SOIL FORMATION

   A. IDENTIFYING THE MAJOR SOIL-FORMING FACTORS

      (1) PARENT MATERIAL
      (2) TOPOGRAPHY
      (3) TIME
      (4) CLIMATE
      (5) BIOTIC FACTORS

   B. DISTINGUISHING THE MAJOR HORIZONS AND SUB-HORIZONS

      (1) TOPSOIL - A HORIZON
      (2) SUBSOIL - B HORIZON
      (3) PARENT MATERIAL - C HORIZON
      (4) BEDROCK - D HORIZON

2. IDENTIFYING THE PHYSICAL PROPERTIES OF THE SOIL

A. CLASSIFYING SOILS AS TO TEXTURE

(1) USING THE "FEEL" TEST
(2) IDENTIFYING THE MAJOR TEXTURE CLASSIFICATIONS
(3) USING THE TEXTURE TRIANGLE

(A) DETERMINING THE RELATIVE PERCENTAGES OF EACH TEXTURAL CLASS
(B) LOCATING THE TEXTURAL CLASSIFICATION

B. CLASSIFYING SOILS AS TO STRUCTURE

C. DETERMINING SOIL PERMEABILITY

D. IDENTIFYING THE FUNCTIONS AND IMPORTANCE OF SOIL WATER

(1) CLASSIFYING SOIL WATER
(2) IDENTIFYING WATER MOVEMENT IN THE SOIL
(3) DETERMINING SOIL WATER HOLDING CAPACITY

E. CLASSIFYING SOIL AS TO COLOR

F. IDENTIFYING THE EFFECTS OF ORGANIC MATTER ON THE SOIL

(1) DETERMINING PHYSICAL EFFECTS
(2) DETERMINING CHEMICAL EFFECTS
(3) DETERMINING BIOLOGICAL EFFECTS

3. IDENTIFYING THE CHEMICAL PROPERTIES OF THE SOIL

A. DETERMINING THE PH VALUE OF A SOIL

B. IDENTIFYING CHEMICAL PROCESSES IN THE SOIL

4. IDENTIFYING THE BIOLOGICAL PROPERTIES OF THE SOIL

A. IDENTIFYING THE IMPORTANCE AND EFFECTS OF SOIL ANIMALS

B. IDENTIFYING THE IMPORTANCE AND EFFECTS OF SOIL PLANTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. IDENTIFY MINERALS AND ROCKS COMMON IN SOIL FORMATION IN THE LOCAL AREA AND OBSERVE THE INFLUENCE OF THE BEDROCK ON THE SOIL PHYSICAL CHARACTERISTICS.

B. TAKE A FIELD TRIP TO A HIGHWAY CUT OR SIMILAR AREA TO OBSERVE THE DEVELOPMENT OF THE REGOLITH.

C. DIG PITS IN DIFFERENT LOCATIONS TO CLOSELY EXAMINE SOIL HORIZONS AND SUB-HORIZONS.

D. MAKE A SOIL MONOLITH USING PLANS AVAILABLE THROUGH THE SOIL CONSERVATION SERVICE.

2. A. PUT A PORTION OF SOIL IN A SEALED JAR OF WATER; SHAKE, AND LET SETTLE OR USE MECHANICAL ANALYSIS METHODS TO DETERMINE THE RELATIVE AMOUNTS OF SAND, SILT AND CLAY IN THE SOIL.

B. PRACTICE USING THE TEXTURE TRIANGLE TO CLASSIFY SOILS.

C. COMPARE WATER-HOLDING CAPACITIES AND PERMEABILITY OF DIFFERENT SOILS BY COMPARING THE AMOUNT OF WATER RUN THROUGH A SOIL WITH THE AMOUNT COLLECTED AFTERWARDS.

D. TAKE FIELD TRIPS TO OBSERVE SOILS WITH DIFFERENT PHYSICAL CHARACTERISTICS INCLUDING SOIL COLOR. TRY TO IDENTIFY THE FACTORS WHICH HAVE DETERMINED THE SOIL COLOR.

E. ANALYZE SAMPLES OF SOIL FROM AREAS OF HIGH AND LOW ORGANIC MATTER CONTENT TO DETERMINE THE EFFECTS OF ORGANIC MATTER ON THE SOIL.

3. DETERMINE THE PH OF DIFFERENT SOILS USING A SOIL TEST KIT OR P-HYDRION PAPERS AND A COLOR CHART.

4. CONSTRUCT A GLASS-SIDED SOIL OBSERVATION BOX TO OBSERVE ACTIVITIES OF SOIL MACROORGANISMS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. DEVELOP AN ESSAY TEST IN WHICH THE STUDENT WILL WRITE HOW EACH OF THE FIVE SOIL-FORMING FACTORS AFFECTS SOIL FORMATION WITH ACCURACY TO BE DETERMINED BY THE INSTRUCTOR.

B. HAVE THE STUDENTS OBSERVE TWO OR THREE SOIL PITS LOCATED IN SIGNIFICANTLY DIFFERENT AREAS AND INDICATE THE HORIZONS OR SUB-HORIZONS PRESENT WITH ACCURACY TO BE DETERMINED BY THE INSTRUCTOR.

2. A. HAVE THE STUDENTS CLASSIFY A NUMBER OF TOP SOIL SAMPLES INTO ONE OF THE THREE MAJOR TEXTURAL CLASSES USING THE FEEL TEST. EVALUATE THE STUDENTS BY MAKING A MECHANICAL ANALYSIS OF THE SAMPLES.

B. GIVE THE STUDENTS A NUMBER OF SOILS WITH HYPOTHETICAL AMOUNTS OF SAND, SILT AND CLAY AND HAVE THEM INDICATE THE TEXTURE USING THE TEXTURE TRIANGLE. THE STUDENTS SHOULD BE ABLE TO ACHIEVE COMPLETE ACCURACY.

C. HAVE THE STUDENTS OBSERVE TWO OR THREE SOIL PITS TO DETERMINE BY THE SOIL PHYSICAL CHARACTERISTICS THEIR PERMEABILITY CLASS. A SOIL CONSERVATION SERVICE REPRESENTATIVE MAY BE NEEDED TO ASSIST IN EVALUATION.

3. HAVE THE STUDENTS USE AN APPROVED METHOD OF DETERMINING THE PH OF PREVIOUSLY TESTED TOP SOIL SAMPLES WITH THEIR ACCURACY TO BE WITHIN ± .5 UNITS OF THE OFFICIAL TEST RESULTS.

4. PREPARE A MATCHING TEST USING SPECIFIC SOIL ORGANISMS AND THE EFFECTS OF THE ORGANISMS ON THE SOIL OR THEIR UNIQUE CHARACTERISTICS. THE DEGREE OF ACCURACY REQUIRED SHOULD BE DETEPMINED BY THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SOIL AUGERS AND PROBES
2. SOIL TEST KIT
3. SOIL THERMOMETER
4. MOISTURE METER
5. SOIL SAMPLE BAGS
6. HAND LENS
7. SET OF SIEVES FOR SOIL ANALYSIS
8. SHOVELS

F. EXAMPLES OF SUPPORTING REFERENCES

1. BUCKMAN, H. O. AND BRADY, N. C. THE NATURE AND PROPERTIES OF SOIL. NEW YORK, NEW YORK: MACMILLAN COMPANY. 1952, 591 PAGES.

   THIS TEXT CONTAINS A COMPLETE DISCUSSION OF THE BASIC SOIL CHARACTERISTICS AND PROCESSES. IT MAY BE USED FOR REFERENCE BY THE TEACHER OR STUDENT.

2. KNUTI, LEO L., KORPI, MILTON AND HIDE, J. D. PROFITABLE SOIL MANAGEMENT. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1970, 376 PAGES.

AN EXCELLENT REFERENCE FOR TEACHER AND STUDENT USE. THIS TEXT CONTAINS A DETAILED DISCUSSION OF THE ITEMS INCLUDED IN THIS UNIT.

LAND USE CLASSIFICATION AND CONSERVATION PRACTICES

UNIT CONCEPT: ACCURATE LAND CLASSIFICATION, SELECTION OF LAND USE SYSTEMS, AND SELECTION AND IMPLEMENTATION OF CONSERVATION PRACTICES WILL RESULT IN INCREASED CROP PRODUCTION AND SUCCESSFUL SOIL CONSERVATION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING THE FIVE MAJOR DETERMINANTS OF LAND CAPABILITY, CLASSIFY A DESIGNATED SOIL INTO ONE OF THE EIGHT LAND CAPABILITY CLASSES WITH ACCURACY REQUIRED OF A SOIL CONSERVATION SERVICE AIDE.

2. WHEN OBSERVING A SPECIFIED LAND AREA, SELECT THE OPTIMUM LAND USE SYSTEM FOR THE LAND CLASS WITH ACCURACY REQUIRED OF A SOIL CONSERVATION SERVICE AIDE.

3. CONSIDERING THE LAND CAPABILITY AND OPTIMUM LAND USE SYSTEM ON A GIVEN AREA, RECOMMEND AND IMPLEMENT THE CONSERVATION PRACTICES WHICH WOULD RESULT IN MINIMUM SOIL LOSS.

B. INSTRUCTIONAL AREAS

1. CLASSIFYING LAND INTO THE EIGHT MAJOR LAND CLASSES

   A. IDENTIFYING LAND CHARACTERISTICS USED IN CLASSIFICATION

      (1) DETERMINING SLOPE
      (2) DETERMINING DEPTH OF SOIL
      (3) DETERMINING SOIL TEXTURE
      (4) DETERMINING INTERNAL DRAINAGE
      (5) DETERMINING EROSION OR DEPTH OF TOPSOIL

   B. IDENTIFYING LAND CAPABILITY CLASSES

      (1) IDENTIFYING THE REQUIREMENTS OF EACH CLASS
      (2) DETERMINING LAND CLASSES ADAPTED TO CROPS
      (3) DETERMINING LAND CLASSES ADAPTED TO PERMANENT VEGETATION ONLY

2. SELECTING THE LAND USE SYSTEM

   A. IDENTIFYING CROPPING SYSTEMS

   B. IDENTIFYING GRASSLAND SYSTEMS

   C. DETERMINING WOODLAND, WILDLIFE, AND RECREATION USES

3. SELECTING AND IMPLEMENTING CONSERVATION PRACTICES

   A. DETERMINING PRACTICES FOR CONTROLLING EROSION AND SEDIMENTATION

      (1) SEEDING SOD FORMING CROPS

         (A) SELECTING EQUIPMENT
         (B) OPERATING EQUIPMENT SAFELY
         (C) MAINTAINING EQUIPMENT

      (2) DEVELOPING GRASS WATERWAYS

         (A) LOCATING THE WATERWAY
         (B) DETERMINING THE DIMENSIONS
         (C) CONSTRUCTING THE WATERWAY
         (D) SEEDING THE WATERWAY
         (E) PROTECTING THE WATERWAY

      (3) DEVELOPING CONTOURS

         (A) OPERATING THE HAND LEVEL
         (B) LAYING OUT CONTOUR LINES

      (4) LAYING OUT CONTOUR STRIPS

      (5) DEVELOPING TERRACES

         (A) SELECTING TYPE
         (B) LOCATING AND STAKING TERRACE LINES
         (C) CONSTRUCTING TERRACES
         (D) MAINTAINING TERRACES
         (E) OPERATING TERRACING EQUIPMENT SAFELY
         (F) MAINTAINING TERRACING EQUIPMENT

      (6) PLANTING SHELTERBELTS

         (A) LOCATING THE SHELTERBELT
         (B) SELECTING TREE SIZE AND SPECIES
         (C) PLANTING TREES
         (D) MAINTAINING AND PROTECTING THE SHELTERBELT

(7) DEVELOPING DIVERSION DITCHES

(A) LOCATING THE DIVERSION DITCH
(B) CONSTRUCTING THE DIVERSION DITCH

B. MANAGING CROP RESIDUES

C. DEVELOPING TILE DRAINAGE SYSTEMS

(1) DETERMINING LOCATION
(2) LAYING OUT THE SYSTEM
(3) CONSTRUCTING THE SYSTEM

(A) OPERATING EQUIPMENT
(B) MAINTAINING EQUIPMENT

D. MAINTAINING AND RE-ESTABLISHING WOODLANDS

(1) USING TIMBER STAND IMPROVEMENT PRACTICES
(2) PLANTING OR RESEEDING TREES
(3) SELECTING TOOLS AND EQUIPMENT
(4) OPERATING TOOLS AND EQUIPMENT
(5) MAINTAINING TOOLS AND EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. PRACTICE DETERMINING SLOPES AT DIFFERENT SITES USING AN ABNEY HAND LEVEL OR A SOIL JUDGING SCORECARD.

   B. PRACTICE DETERMINING THE TEXTURE OF DIFFERENT SOILS AND COMPARING THE FINDINGS TO MECHANICAL ANALYSIS RESULTS.

   C. DIG A NUMBER OF SOIL INSPECTION PITS AT DIFFERENT SITES, AND USE A SOIL JUDGING SCORECARD TO DETERMINE LAND CAPABILITY CLASS.

2. TAKE FIELD TRIPS TO AREAS WITH DIFFERING LAND FEATURES AND HAVE THEM DETERMINE THE OPTIMUM LAND USE SYSTEM FOR EACH AREA.

3. COOPERATE WITH THE SOIL CONSERVATION SERVICE IN OBSERVING AND ASSISTING IN DEVELOPING SOIL CONSERVATION PRACTICES ON COOPERATORS' LANDS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE THE STUDENTS HYPOTHETICAL DATA FROM A NUMBER OF DIFFERENT SITES FOR THEM TO DETERMINE THE APPROPRIATE LAND CLASS. USE LAND JUDGING SCORECARDS FOR LAND CLASS DETERMINATION AND EVALUATION.

2. DIG A NUMBER OF DIFFERENT SOIL PITS AT DIFFERENT SITES FOR THE STUDENTS TO DETERMINE THE OPTIMUM LAND USE. HAVE A SOIL CONSERVATION SERVICE EMPLOYEE ASSIST IN SELECTION OF SITES AND IN STUDENT EVALUATION.

3. HAVE THE STUDENTS SELECT THE APPROPRIATE CONSERVATION PRACTICES FOR THE PREVIOUSLY MENTIONED SITES WITH THE EVALUATION TO BE CONDUCTED BY THE INSTRUCTOR AND SOIL CONSERVATION SERVICE EMPLOYEE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. ABNEY HAND LEVELS
2. SOIL JUDGING SCORE CARDS
3. SOIL AUGERS AND PROBES
4. SHOVELS
5. HAND LENS
6. SET OF SIEVES FOR SOIL ANALYSIS
7. FORESTRY EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. FOSTER, A. B. APPROVED PRACTICES IN SOIL CONSERVATION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS. 1964, 384 PAGES.

   INCLUDED IN THIS TEXT ARE DETAILS CONCERNING THE DEVELOPMENT OF MOST SOIL AND WATER CONSERVATION PRACTICES.

2. KNUTI. LEO L., KORPI, MILTON AND HIDE, J. D. PROFITABLE SOIL MANAGEMENT. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1970, 376 PAGES.

   THIS TEXT INCLUDES A DISCUSSION OF LAND CLASSIFICATION, SELECTION OF LAND USE SYSTEMS, AND SELECTION OF CONSERVATION PRACTICES OF VALUE TO BOTH THE TEACHER AND STUDENT.

SOIL FERTILITY MANAGEMENT

UNIT CONCEPT: EFFECTIVE MANAGEMENT OF SOIL FERTILITY WHICH INCLUDES USE OF SOIL TEST DATA, WILL RESULT IN INCREASED PRODUCTION FROM THE LAND.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. TAKE SOIL SAMPLES REPRESENTATIVE OF AN AREA, CORRECTLY COMPLETE THE SOIL DATA FORMS, AND SUBMIT THEM FOR LABORATORY ANALYSIS SO THAT THE TEST RESULTS WILL ACCURATELY REFLECT THE FERTILITY CONDITIONS OF THE SOIL.

2. USING SOIL SAMPLES AND A PH TESTING KIT, TEST SOIL FOR ACIDITY OR ALKALINITY WITH ACCURACY OF ± .5 PH AND RECOMMEND PROPER SOIL ADDITIVES TO CORRECT THE PH LEVEL TO MEET PLANT NEEDS.

3. WHEN GIVEN SOIL TEST RESULTS, INTERPRET THE TEST DATA AND MAKE RECOMMENDATIONS FOR NECESSARY APPLICATIONS OF LIME, FERTILIZER, AND MICRONUTRIENTS SO AS TO OBTAIN MAXIMUM PRODUCTION FROM A LAND AREA.

4. WHEN GIVEN THE TYPE OF INDIVIDUAL INGREDIENTS TO BE USED, CALCULATE THE AMOUNTS OF NITROGEN, PHOSPHATE AND POTASH TO BLEND TO OBTAIN A SPECIFIED ANALYSIS IN A DRY BULK AMOUNT OF FERTILIZER WITHIN ± 1%.

5. WHEN GIVEN A SPECIFIED LAND AREA, CROP, AND SOIL TEST DATA, APPLY THE REQUIRED AMOUNTS OF LIME, FERTILIZER, MICRONUTRIENTS, AND ORGANIC MATTER IN A MANNER WHICH WILL MEET THE RECOMMENDATIONS.

B. INSTRUCTIONAL AREAS

1. TAKING SOIL SAMPLES

   A. DEFINING THE PURPOSE AND VALUE OF SOIL ANALYSIS

   B. GETTING A REPRESENTATIVE SAMPLE

   C. TAKING THE SOIL SAMPLE

(1) DETERMINING DEPTH
(2) DETERMINING TIME AND PLACES

D. PROCESSING THE SOIL SAMPLE

E. DETERMINING TIME BETWEEN TESTS

2. TESTING SOIL PH

A. USING THE PH TESTING KIT

B. CALCULATING AMOUNTS OF LIME OR SOIL ADDITIVES NECESSARY TO CORRECT PH

3. INTERPRETING SOIL TEST DATA

A. IDENTIFYING NEEDED LIME APPLICATIONS

B. IDENTIFYING NEEDED FERTILIZER APPLICATIONS

C. IDENTIFYING NEEDED MICRONUTRIENTS

4. FORMULATING DRY BULK BLENDED FERTILIZERS

A. SELECTING INDIVIDUAL INGREDIENTS

B. CALCULATING AMOUNTS OF INGREDIENTS NEEDED FOR SPECIFIC ANALYSES

5. IMPLEMENTING SOIL TEST RECOMMENDATIONS

A. LIMING ACIDIC SOILS

(1) SELECTING MATERIALS
(2) TIMING
(3) DETERMINING METHODS OF APPLICATION

(A) OPERATING EQUIPMENT
(B) MAINTAINING EQUIPMENT

B. FERTILIZING SOILS

(1) SELECTING FERTILIZER

(A) IDENTIFYING SOURCES
(B) DETERMINING ANALYSIS NEEDED

(1) DETERMINING MAJOR NUTRIENTS NEEDED
(2) DETERMINING MICRONUTRIENTS NEEDED

(C) DETERMINING FORM TO USE

C. APPLYING FERTILIZER

(1) SELECTING METHOD OF FERTILIZATION
(2) DETERMINING PLACEMENT
(3) TIMING OF FERTILIZATION
(4) OPERATING AND MAINTAINING EQUIPMENT

D. ADDING ORGANIC MATTER TO SOILS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS TAKE SOIL SAMPLES AT HOME, AT THE SCHOOL OR ON COOPERATORS' LANDS AND PREPARE AND SUBMIT THEM FOR LABORATORY TESTING.

2. A. USE A PH TEST KIT TO PRACTICE DETERMINING PH OF DIFFERENT SOIL SAMPLES.

   B. DEVELOP CLASSROOM DEMONSTRATIONS COMPARING PLANTS GROWING IN ACID, NEUTRAL AND ALKALINE SOILS.

3. HAVE STUDENTS INTERPRET THE DATA RECEIVED FROM THEIR SOIL TESTS.

4. A. GIVEN THE SPECIFIC INGREDIENTS TO USE, PRACTICE COMPUTING FERTILIZER INGREDIENTS NEEDED TO BLEND DIFFERING AMOUNTS OF FERTILIZER.

   B. VISIT A FERTILIZER PLANT TO OBSERVE COMMERCIAL FERTILIZER PRODUCTION.

5. A. OBSERVE AND/OR ASSIST COMMERCIAL FERTILIZER APPLICATORS AND LIME APPLICATORS IN FERTILIZING AND LIMING LAND AREAS.

   B. HAVE STUDENTS BRING IN DIFFERENT FERTILIZER BAGS AND EXPLAIN ANALYSIS DATA.

   C. PLAN AND IMPLEMENT FERTILIZER TRAILS IN THE GREENHOUSE AND/OR ON FIELD PLOTS TO DETERMINE FERTILIZER EFFECTS AND DIFFERENCES BETWEEN SPECIFIC TYPES AND ANALYSES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. ASSIGN PAIRS OF STUDENTS A LAND AREA FROM WHICH THEY ARE TO TAKE A REPRESENTATIVE SOIL SAMPLE AND PREPARE THE SAMPLE FOR LABORATORY TESTING. EVALUATE THE STUDENTS AS TO THEIR CORRECTNESS OF TECHNIQUE.

2. ASSIGN EACH STUDENT A SOIL SAMPLE TO TEST WHICH HAS BEEN PREVIOUSLY TESTED FOR PH BY THE INSTRUCTOR. EVALUATE THE STUDENT FOR CORRECTNESS OF TECHNIQUE AND FOR ACCURACY WHICH SHOULD BE WITHIN ± .5 PH OF THE PREVIOUS TEST.

3. GIVE EACH STUDENT AN EXAMPLE OF A SOIL TEST RESULT TO INTERPRET. THE STUDENT SHOULD INDICATE THE AMOUNTS OF LIME AND NUTRIENTS TO APPLY AND THE APPROPRIATE TIME OF YEAR FOR APPLICATION. THE STUDENT SHOULD BE EVALUATED AS TO COMPLETENESS AND ACCURACY OF HIS TEST DATA INTERPRETATION AND RECOMMENDATIONS.

4. HAVE THE STUDENTS CALCULATE THE AMOUNTS OF NUTRIENTS THEY WOULD BLEND TO OBTAIN SPECIFIED AMOUNTS AND ANALYSES OF FERTILIZERS. THE STUDENT'S ACCURACY SHOULD BE WITHIN 1% OF THE DESIRED ANALYSIS.

5. HAVE THE STUDENTS USE THE DATA IN ITEM 3 AS A BASIS FOR INDICATING THE ALTERNATIVE METHODS THAT COULD BE USED TO APPLY THE FERTILIZER MATERIALS TO MEET THE RECOMMENDATIONS. THE STUDENT SHOULD BE ABLE TO INDICATE AT LEAST THREE DIFFERENT APPLICATION METHODS OR PROCECURES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SOIL PROBES
2. SOIL AUGER
3. SOIL PH TEST KIT
4. SHOVEL OR SPADE

F. EXAMPLES OF SUPPORTING REFERENCES

1. FERTILIZER SALES AND SERVICEMAN. COLLEGE STATION, TEXAS: TEACHING MATERIALS CENTER, TEXAS A & M UNIVERSITY.

   THIS GUIDE PROVIDES EXCELLENT INFORMATION CONCERNING FERTILIZERS, FERTILIZER ANALYSIS, AND BLENDING OF FERTILIZERS.

2. KNUTI, LEO L., KORPI, MILTON AND HIDE, J. C. PROFITABLE SOIL MANAGEMENT. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1970, 376 PAGES.

THIS TEXT IS SUITABLE FOR USE BY THE TEACHER AND STUDENT AS A REFERENCE FOR THE ELEMENTS ESSENTIAL TO PLANT GROWTH, SOIL REACTIONS, AND METHODS AND MATERIALS USED IN CORRECTING SOIL FERTILITY.

3. STALLINGS, J. H. SOIL - USE AND IMPROVEMENT. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1957, 403 PAGES.

   THIS TEXT INCLUDES MATERIAL ON SOIL AND PLANT TISSUE TESTING AS WELL AS A DISCUSSION OF SOIL CONSERVATION PRACTICES USED THROUGHOUT THE NATION.

4. STATE AGRONOMY GUIDES.

   THESE GUIDES, WHICH ARE AVAILABLE IN MOST STATES, PROVIDE ACCURATE SOIL, CROPS, AND FERTILIZATION INFORMATION WHICH SPECIFICALLY APPLIES TO THAT STATE.

MAP INTERPRETATION AND USE

UNIT CONCEPT: SAFE AND EFFICIENT RURAL [illegible] URBAN LAND USE AND CONSERVATION PRACT[illegible]ILITATED THROUGH PROPER USE OF [illegible]OGRAPHS, TOPOGRAPHICAL MAPS, A[illegible]APS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. READ AN AERIAL PHOTOGRAPH TO DETERMINE DISTANCES, PRESENT LAND USE, WOODLAND, WATER, A[illegible] LAND FEATURES AS NEEDED FOR CONSERVATION PLANNING.

2. INTERPRET ELEMENTS OF A TOPOGRAPHIC MAP SUCH AS ELEVATION, WATER FEATURES, LAND FEATURES, AND MAN-MADE FEATURES AS NEEDED FOR DETAILED CONSERVATION PLANNING.

3. INTERPRET SOIL SURVEY MAPS AND REPORTS WITH ACCURACY NEEDED TO OBTAIN SOIL AND SITE INFORMATION FOR LAND USE PLANNING.

4. INTERPRET THE ELEMENTS AND RECOMMENDATIONS OF A CONSERVATION LAND USE PLAN FOR A FARM OR OTHER PROPERTY WITH ACCURACY REQUIRED OF A SOIL CONSERVATION AIDE.

B. INSTRUCTIONAL AREAS

1. READING AERIAL PHOTOGRAPHS

   A. IDENTIFYING SOIL CONSERVATION USES

   B. USING A STEREOSCOPE

   C. USING PLANIMETERS AND GRIDS

2. INTERPRETING TOPOGRAPHICAL MAPS

   A. DETERMINING SCALE

   B. INTERPRETING COLOR CODES

C. INTERPRETING SYMBOLS

D. USING CONTOUR LINES TO DETERMINE ELEVATION AND RELIEF

3. INTERPRETING SOILS MAPS

A. READING SYMBOLS

B. OBTAINING SOILS INFORMATION

C. DETERMINING OPTIMUM LAND USE

D. IDENTIFYING SPECIAL LAND USE HAZARDS

4. INTERPRETING CONSERVATION LAND USE PLANS

A. IDENTIFYING SOILS AND CONDITIONS PRESENT

B. IDENTIFYING PRESENT LAND USE

C. IDENTIFYING RECOMMENDATIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. PRACTICE USING THE STEREOGRAPH TO INTERPRET AERIAL PHOTOGRAPHS.

B. PRACTICE USING PLANIMETERS AND GRIDS TO DETERMINE DISTANCES ON AERIAL PHOTOGRAPHS.

2. A. PRACTICE FINDING LAND AND MAN-MADE FEATURES, DETERMINING DISTANCES AND DETERMINING DIFFERENCES IN ELEVATION OF POINTS ON TOPOGRAPHIC MAPS.

B. TAKE FIELD TRIPS TO LAND AREAS AND COMPARE LAND FEATURES WITH THOSE FOUND ON SOILS AND TOPOGRAPHIC MAPS.

3. A. OBSERVE AND ASSIST SOIL CONSERVATION SERVICE REPRESENTATIVES IN PREPARING LAND USE PLANS AND MAKING SOIL SURVEYS WHEN POSSIBLE.

B. HAVE REPRESENTATIVES FROM THE SOIL CONSERVATION SERVICE DISCUSS SOIL MAPPING TECHNIQUES AND ASSIST STUDENTS IN MAPPING PRESENT LAND USE ON MAPS.

C. USING SOILS MAPS AND OTHER RELATED INFORMATION, HAVE THE STUDENTS DETERMINE THE FEASIBILITY OF DEVELOPING SPECIAL LAND USE FEATURES SUCH AS HOUSING, ROAD DEVELOPMENT, CAMPING AREAS, AND SEPTIC TANKS ON SELECTED SITES.

4. TAKE FIELD TRIPS TO FARMS OR LAND AREAS ON WHICH CONSERVATION LAND USE PLANS HAVE BEEN MADE TO OBSERVE THE RESULTS OF USE OF THE PLAN.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT IDENTIFY LAND FEATURES AND DETERMINE DISTANCES ON AN AERIAL PHOTOGRAPH USING THE NECESSARY STEREOSCOPE AND GRIDS. THE DEGREE OF ACCURACY REQUIRED SHOULD BE DETERMINED BY THE INSTRUCTOR WITH HELP FROM A SOIL CONSERVATION SERVICE REPRESENTATIVE IF NEEDED.

2. GIVE EACH STUDENT A COPY OF THE SAME TOPOGRAPHIC MAP. UPON LOCATING TWO POINTS ON THE MAP INDICATED BY THE INSTRUCTOR, THE STUDENT SHOULD DETERMINE THE DIFFERENCE IN ELEVATION BETWEEN THE POINTS WITH ACCURACY WITHIN ± FIVE FEET.

3. GIVE THE STUDENTS A SUGGESTED LAND USE FOR A DESIGNATED SITE ON A SOILS MAP. HAVE THE STUDENT LIST THE FACTORS THAT COULD BE OBTAINED FROM THE MAP THAT HE WOULD USE TO DECIDE WHETHER THE SITE WAS SUITABLE FOR THE SUGGESTED USE. EVALUATE THE STUDENT AS TO THE COMPLETENESS OF THE INFORMATION THAT HE OBTAINED FROM THE MAP AND HIS DECISION.

4. GIVE EACH STUDENT A COPY OF A CONSERVATION LAND USE PLAN. HAVE THEM WRITE THE RECOMMENDATIONS THEY WOULD GIVE TO THE LAND OWNER AS TO HOW THE LAND SHOULD BE USED. EVALUATE THE STUDENTS FOR THEIR COMPLETENESS AND ACCURACY IN INTERPRETING THE PLAN.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. AERIAL PHOTOGRAPHS, TOPOGRAPHIC MAPS, SOIL SURVEYS, AND LAND USE PLANS.

2. PLANIMETERS

3. AERIAL PHOTO INTERPRETATION GRIDS

4. STEREOSCOPES

5. GRAPHIC SCALES

6. SOIL PROBES OR AUGERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AVERY, T. EUGENE. INTERPRETATION OF AERIAL PHOTOGRAPHS. MINNEAPOLIS, MINNESOTA: BURGESS PUBLISHING COMPANY. 1968, 324 PAGES.

   AN EXCELLENT TEACHER REFERENCE FOR PROCEDURES TO FOLLOW IN INTERPRETING AERIAL PHOTOGRAPHS.

2. CONSERVATION AIDE III. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 61 PAGES.

   BOOKLET NUMBER III CONTAINS PRACTICAL EXERCISES FOR THE STUDENT TO COMPLETE USING SOIL MAPS AND SOIL SURVEYS AS WOULD BE USED BY A SOIL CONSERVATION AIDE.

3. SOIL SURVEYS AND LAND USE PLANNING. MADISON, WISCONSIN: SOIL SCIENCE SOCIETY OF AMERICA AND AMERICAN SOCIETY OF AGRONOMY, THE SOCIETIES. 1966.

   CONTAINS A DISCUSSION OF THE USE OF SOIL SURVEYS IN LAND USE PLANNING.

4. SOURCE OF TOPOGRAPHICAL MAPS. ARLINGTON, VIRGINIA: WASHINGTON DISTRIBUTION SECTION, U.S. GEOLOGICAL SURVEY.

LAND MEASUREMENT

UNIT CONCEPT: COMPETENT LAND MEASUREMENT WILL RESULT IN MORE EFFECTIVE SURVEYING AND LAND USE PLANNING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. OBTAIN DISTANCE BY PACING ON A LEVEL FIELD WITH A VARIATION OF LESS THAN TWO FEET PER 100 FEET.

2. OBTAIN DISTANCE BY CHAINING ON LAND WITH LESS THAN TWO PERCENT SLOPE WITH LESS THAN 0.02 PERCENT ERROR.

3. OBTAIN DISTANCE WITH A STEEL TAPE ON SLOPING TERRAIN (OVER 2%) BY BREAKING CHAIN WHEN NECESSARY WITH AN ALLOWABLE ERROR OF TWO FEET/500 FEET.

4. ESTABLISH A PREDETERMINED ANGLE OF DECLINATION ON A TRANSIT OR A SURVEYOR'S STAFF COMPASS TO WITHIN ONE DEGREE.

5. LAY OUT A PERPENDICULAR LINE ON THE GROUND FROM A BASE LINE WITH A STEEL TAPE USING THE 3-4-5 METHOD AND/OR THE CHORD METHOD WITH AN ALLOWABLE ERROR OF ONE INCH PER 40 FEET OF PERPENDICULAR LINE.

6. CLOSE A TRAVERSE IN THE FIELD USING A TRANSIT OR SURVEYOR'S STAFF COMPASS AND STEEL TAPE WITH THE TRAVERSE TO CLOSE WITHIN ONE FOOT PER 500 FEET OF DISTANCE.

7. DETERMINE THE FIELD AREA, WITHIN ONE ACRE PER TWENTY ACRES OF FIELDS HAVING TRIANGULAR, RECTANGULAR, TRAPEZOIDAL, TRAPEZIUM, OR CURVED BOUNDARIES USING LAND MEASUREMENTS AND SET FORMULAS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING METHODS OF LINEAR MEASUREMENT

   A. PACING

   B. USING THE ODOMETER

C. USING THE STEEL TAPE

(1) IDENTIFYING UNITS OF MEASURE
(2) IDENTIFYING PARTS AND USE
(3) CARING FOR THE TAPE

2. CHAINING ON LAND LESS THAN 2% SLOPE

A. DETERMINING JOB ASSIGNMENTS

B. USING VERBAL INSTRUCTIONS

C. RECORDING UNEVEN DISTANCES

3. CHAINING ON LAND OVER 2% SLOPE

A. BREAKING CHAIN

B. USING THE PLUMB BOB

C. USING RANGE POLES

4. USING A STAFF COMPASS

A. OPERATING THE COMPASS

(1) IDENTIFYING COMPASS PARTS
(2) CARING FOR THE COMPASS

B. IDENTIFYING ANGLES OF DECLINATION

(1) TRUE NORTH
(2) MAGNETIC NORTH

C. SETTING OFF ANGLE OF DECLINATION

D. WRITING BEARINGS

5. LAYING OUT PERPENDICULAR LINES

A. USING THE 3-4-5 METHOD

B. USING THE CHORD METHOD

6. USING TRAVERSE METHODS OF MEASUREMENT

A. MAKING AN OPEN TRAVERSE

(1) RECORDING NOTES
(2) USING STEEL TAPE AND COMPASS

B. MAKING A CLOSED TRAVERSE

7. DETERMINING LAND AREA

   A. MAKING A CLOSED TRAVERSE

   B. MAKING CALCULATIONS OF TAPED AREAS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. CHAIN A 100-FOOT DISTANCE, DETERMINE THE NUMBER OF PACES NEEDED TO PACE THE DISTANCE, AND CALCULATE THE LENGTH OF EACH PACE.

   B. PACE A FOUR-SIDED FIGURE ON LEVEL GROUND AND CHECK THE DISTANCE BY CHAINING.

2. PRACTICE MEASURING DISTANCES BY CHAINING ON LAND WITH LESS THAN 2% SLOPE.

3. SELECT A TRAVERSE OF KNOWN DISTANCE ON SLOPING TERRAIN (OVER 2%) AND DETERMINE DISTANCE BY BREAKING CHAIN WHEN NECESSARY.

4. A. TAKE A POINT ON A TOPOGRAPHIC MAP AND SELECT A DESTINATION POINT. ATTACH STRINGS FROM THE STARTING POINT ALONG A TRUE NORTH DIRECTION AND A MAGNETIC NORTH DIRECTION. HAVE STUDENTS CALCULATE THE DISTANCE BY WHICH THEY WOULD HAVE MISSED THE DESTINATION BY FOLLOWING THE MAGNETIC NORTH WITHOUT ALLOWING FOR ANGLE OF DECLINATION.

   B. PRACTICE USING A COMPASS TO FOLLOW A TRUE BEARING.

5. ERECT PERPENDICULARS USING THE 3-4-5 METHOD OR CHORD METHOD AND STAKE IT OUT. USE A TRANSIT TO CHECK THE ACCURACY.

6. RUN A SERIES OF OPEN TRAVERSES AT DIFFERENT TRUE BEARINGS TO A CLOSED TRAVERSE CONCLUSION.

7. PRACTICE DETERMINING ACREAGES BY RUNNING CLOSED TRAVERSES AND CALCULATING THE RESULTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. LAY OUT A PREVIOUSLY MEASURED COURSE WHICH CONTAINS DIFFERING TOPOGRAPHY FOR THE STUDENTS TO PACE. EVALUATE THE STUDENTS BY CHAINING THE SAME COURSE AND DETERMINING THEIR ACCURACY WHICH SHOULD BE WITHIN ± 2 FEET/100 FEET TRAVELLED.

2. HAVE PAIRS OF STUDENTS CHAIN THE DISTANCE BETWEEN TWO DESIGNATED POINTS ON LEVEL GROUND. ACCURACY SHOULD BE WITHIN 0.02%.

3. HAVE PAIRS OF STUDENTS CHAIN THE DISTANCE BETWEEN TWO POINTS ON SLOPING TERRAIN. ACCURACY SHOULD BE WITHIN TWO FEET PER 500 FEET.

4. HAVE EACH STUDENT ESTABLISH A PREDETERMINED ANGLE OF DECLINATION ON A TRANSIT OR A SURVEYOR'S STAFF COMPASS. HAVE A SURVEYOR OR SOIL CONSERVATION SERVICE EMPLOYEE ASSIST IN THE EVALUATION IF NEEDED.

5. HAVE PAIRS OF STUDENTS LAY OUT A PERPENDICULAR TO A BASE LINE USING A STEEL TAPE AND ONE OF THE PREVIOUSLY MENTIONED METHODS. ACCURACY SHOULD BE WITHIN ONE INCH IN FORTY FEET OF PERPENDICULAR LINE.

6. HAVE PAIRS OF STUDENTS COMPLETE A CLOSED TRAVERSE OF A LAND AREA USING A TRANSIT OR STAFF COMPASS AND STEEL TAPE. THE STUDENTS SHOULD BE EVALUATED AS TO CORRECTNESS OF TECHNIQUE AND ACCURACY WHICH SHOULD BE WITHIN ONE FOOT PER 500 FEET OF DISTANCE.

7. GIVE THE STUDENTS SEVERAL HYPOTHETICAL ODD-SHAPED LAND AREA DIMENSIONS FOR THEM TO CALCULATE ACREAGE. THE RESULTS OF THEIR CALCULATION SHOULD BE WITHIN .2 ACRE IN TWENTY ACRES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. STEEL TAPES, 100' SURVEYOR'S
2. PLUMB BOBS
3. CHAINING PINS
4. FIELD NOTEBOOKS
5. RANGE POLES
6. TRANSIT
7. SURVEYOR'S STAFF COMPASS

F. EXAMPLES OF SUPPORTING REFERENCES

1. SCHWAB, GLENN O., FREVERT, RICHARD K., BARNES, KENNETH K. AND EDMINSTER, TALCOTT W. ELEMENTARY SOIL AND WATER ENGINEERING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1965, 296 PAGES.

   THIS TEXT CONTAINS A COMPLETE DISCUSSION OF THE METHODS USED IN LINEAR MEASUREMENT.

ELEMENTARY SURVEYING

UNIT CONCEPT: ACCURATE SURVEYING WILL RESULT IN EFFECTIVE AND EFFICIENT DEVELOPMENT OF AGRICULTURAL RESOURCES STRUCTURES AND LAND USE SUCH AS SOIL AND WATER CONSERVATION STRUCTURES AND DEVELOPMENT OF OUTDOOR RECREATION AREAS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIED SURVEYING TASK, SELECT THE TYPE OF LEGAL OR CONSERVATION SURVEY WHOSE DEFINITION APPLIES TO THE TASK.

2. WHEN GIVEN EXAMPLES OF THE COMMON TYPES OF LEVELS AND TRANSITS, IDENTIFY EACH TYPE AND INDICATE THE CONDITIONS UNDER WHICH IT COULD BE USED WITH COMPLETE ACCURACY.

3. WHEN GIVEN A TRANSIT AND/OR A LEVEL, IDENTIFY THE DIFFERENT PARTS AND THEIR FUNCTIONS AND TRANSPORT, CARRY, SET UP, AND MAINTAIN THE INSTRUMENTS IN A MANNER WHICH WILL PREVENT DAMAGE OR UNNECESSARY WEAR.

4. WHEN GIVEN THE FOUR TYPES OF SURVEYING RODS, LIST THE SPECIFIC USES THAT ARE MADE OF EACH TYPE WITH 100% ACCURACY.

5. USING THE NEEDED SURVEYING INSTRUMENTS, PERFORM THE OPERATIONS USED IN SURVEYING INCLUDING THE USE OF HAND SIGNALS FOR COMMUNICATION BETWEEN THE INSTRUMENT MAN AND ROD MAN WITH ACCURACY NEEDED TO PERFORM SURVEYING OPERATIONS.

6. WHEN GIVEN APPROPRIATE SURVEYING INSTRUMENTS AND A SPECIFIED LAND AREA TO BE SURVEYED, PERFORM EACH OF THE THREE METHODS OF CONSERVATION SURVEYING (DIFFERENTIAL LEVELING, PROFILE LEVELING, AND TOPOGRAPHIC SURVEYING) AND RECORD FIELD NOTES WITH ACCURACY REQUIRED OF A SOIL CONSERVATION AIDE.

7. USING A HAND LEVEL, DETERMINE SLOPES WITH ACCURACY WITHIN 2% SLOPE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE TYPES OF SURVEYS

A. IDENTIFYING THE LEGAL SURVEYS USED IN THE REGION

(1) METES AND BOUNDS SYSTEM
(2) RECTANGULAR SURVEY SYSTEM

B. IDENTIFYING THE TYPES AND USES OF CONSERVATION SURVEYS

(1) DIFFERENTIAL LEVELING
(2) PROFILE LEVELING
(3) TOPOGRAPHIC SURVEYING

2. IDENTIFYING THE USES OF EACH LEVEL OR TRANSIT

A. IDENTIFYING THE COMMON TYPES OF LEVELS OR TRANSIT

(1) TRANSIT LEVEL
(2) CONTRACTOR'S LEVEL
(3) BUILDER'S LEVEL
(4) FARM LEVEL
(5) CONVERTIBLE LEVEL
(6) DUMPY LEVEL

B. IDENTIFYING THE PARTS OF A TRANSIT AND/OR LEVEL

3. CARING FOR AND PROTECTING THE LEVEL OF TRANSIT

A. TRANSPORTING THE LEVEL OR TRANSIT

B. CARRYING THE LEVEL OR TRANSIT

C. SETTING UP THE LEVEL OR TRANSIT

D. CLEANING AND OILING THE LEVEL OR TRANSIT

E. MAKING MINOR ADJUSTMENTS

4. IDENTIFYING THE TYPES OF SURVEYOR'S RODS AND THEIR USE

5. PERFORMING BASIC SURVEYING OPERATIONS

A. IDENTIFYING BENCHMARKS

B. TAKING A BACKSIGHT

C. TAKING A FORESIGHT

D. CALCULATING THE HEIGHT OF INSTRUMENT

E. ESTABLISHING A TURNING POINT

F. USING SURVEYOR'S HAND SIGNALS

6. DIFFERENTIAL LEVELING

A. IDENTIFYING THE PURPOSES OR USES OF DIFFERENTIAL LEVELING

B. SETTING UP AND LEVELING THE LEVEL OR TRANSIT

C. READING THE ROD

D. RECORDING FIELD NOTES

E. RUNNING A BENCH LEVEL CIRCUIT

(1) SELECTING A BENCH MARK
(2) TAKING A BACKSIGHT
(3) CALCULATING THE HEIGHT OF INSTRUMENT
(4) SELECTING A TURNING POINT
(5) TAKING A FORESIGHT
(6) CLOSING THE BENCH LEVEL CIRCUIT
(7) CALCULATING THE PERCENT ERROR

7. PROFILE LEVELING

A. IDENTIFYING THE PURPOSES OR USES OF PROFILE LEVELING

B. TAKING THE BACKSIGHT READING FROM THE BENCHMARK

C. TAKING FORESIGHTS

D. ESTABLISHING TURNING POINTS

E. RECORDING THE FIELD NOTES

F. PLOTTING THE PROFILE FROM FIELD NOTES

G. PLOTTING PHYSICAL CHANGES PLANNED ON THE AREA MEASURED

8. TOPOGRAPHIC SURVEYING

A. IDENTIFYING THE PURPOSES OR USES OF TOPOGRAPHIC SURVEYS

B. USING THE TRANSIT AND STADIA METHOD

(1) SETTING UP THE TRANSIT

(A) LEVELING THE PLATES
(B) SETTING THE COMPASS

(2) TAKING THE BACKSIGHT AND ROD READING
(3) USING STADIA HAIRS TO DETERMINE DISTANCE
(4) READING THE COMPASS AND VERNIER
(5) RECORDING FIELD NOTES
(6) DRAWING THE LAYOUT USING THE PROTRACTOR RULE

C. USING THE GRID SYSTEM

(1) DETERMINING WHEN TO USE THE GRID SYSTEM
(2) ESTABLISHING GRID LOCATIONS
(3) ESTABLISHING GRID LINES
(4) RECORDING FIELD NOTES
(5) PREPARING THE MAP

D. USING THE PLANETABLE AND ALIDADE METHOD

(1) DETERMINING WHEN TO USE THE PLANETABLE SYSTEM
(2) LOCATING THE INSTRUMENT
(3) SETTING UP THE INSTRUMENTS
(4) PLOTTING POINTS ON DRAWING BOARD

9. USING THE HAND LEVEL TO DETERMINE SLOPE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE THE DISTRICT SOIL CONSERVATIONIST INDICATE FARMS ON A TOPOGRAPHICAL MAP AND HAVE THE STUDENTS WRITE THE FARMS' LEGAL DESCRIPTIONS.

   B. USE A TOPOGRAPHICAL MAP TO LOCATE UNITED STATES GEOLOGICAL SURVEY BENCH MARKS IN THE AREA.

2. HAVE THE STUDENTS DO INDEPENDENT RESEARCH ON THE DIFFERENT TYPES OF LEVELS AND THE USES MADE OF EACH.

3. PRACTICE SETTING UP AND LEVELING A LEVEL OR TRANSIT UNDER DIFFERENT FIELD CONDITIONS WITH THE SUPERVISION OF THE INSTRUCTOR OR A SOIL CONSERVATION SERVICE EMPLOYEE.

4. HAVE A SOIL CONSERVATION SERVICE EMPLOYEE EXPLAIN THE USES MADE OF DIFFERENT TYPES OF TARGET RODS AND DEMONSTRATE HOW THEY ARE USED IF MORE THAN ONE TYPE IS AVAILABLE.

5. A. HAVE EACH STUDENT DIAGRAM ON PAPER A BENCHMARK, FORESIGHT, BACKSIGHT, AND TURNING POINT INDICATING THE POSITION OF THE LEVEL AND THE LINE OF SIGHT.

   B. RUN BENCH LEVEL CIRCUITS ALTERNATING DUTIES AS THE INSTRUMENT MAN AND THE ROD MAN AND RECORDING FIELD NOTES.

C. GIVEN THE NECESSARY INFORMATION FOR DIFFERENT SURVEYS, PRACTICE FILLING OUT THE FRONT COVER PAGES OF A FIELD NOTEBOOK FOR BENCH LEVEL CIRCUITS IN THE COUNTY.

D. HAVE THE INSTRUCTOR OR A SOIL CONSERVATION SERVICE EMPLOYEE DEVELOP A NUMBER OF HYPOTHETICAL BENCH LEVEL CIRCUITS FOR STUDENTS TO PRACTICE COMPLETING A FIELD NOTEBOOK AND CALCULATING RESULTS.

6. A. MAKE CHARTS FROM FIELD NOTES OF HYPOTHETICAL PROFILE SURVEYS AND INDICATE PROPOSED PHYSICAL CHANGES ON THE AREA AS GIVEN BY THE INSTRUCTOR.

B. USING THE PROFILE SURVEY FOR AN AREA TO BE TILED, COMPLETE THE FIELD NOTEBOOK WITH A CUT SHEET AND CHART THE PROFILE AND TILE LINE.

C. PRACTICE USING STADIA HAIRS ON A TRANSIT FOR DETERMINING DISTANCES, THEN CHECK THE DISTANCE BY CHAINING.

D. USING INFORMATION FROM VARIOUS TOPOGRAPHICAL SURVEYS, USE A PROTRACTOR RULE TO DRAW LAYOUTS OF THE AREAS SURVEYED.

E. TAKE FIELD TRIPS TO SITES WHERE SOIL CONSERVATION SERVICE EMPLOYEES ARE RUNNING SURVEYS TO OBSERVE AND ASSIST IN THE WORK WHEN POSSIBLE.

F. HAVE EACH STUDENT DEVELOP A TOPOGRAPHICAL MAP OF AN AREA ON WHICH THE CLASS HAS PERFORMED A TOPOGRAPHICAL SURVEY.

7. USE A HAND LEVEL TO STAKE OUT CONTOUR LINES USING A PARTNER AND ALTERNATING RESPONSIBILITIES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST FOR STUDENTS TO MATCH THE DIFFERENT TYPES OF LEGAL AND CONSERVATION SURVEYS TO THEIR DEFINITIONS WITH ACCURACY NEEDED TO SELECT THE CORRECT SURVEYING METHOD FOR EACH ASSIGNED TASK IN THE FIELD.

2. USE SLIDES OR PICTURES OF THE DIFFERENT TYPES OF TRANSITS AND LEVELS FOR THE STUDENTS TO IDENTIFY AND INDICATE WHEN EACH TYPE IS USED WITH COMPLETE ACCURACY.

3. GIVE EACH STUDENT A DIAGRAM OF A TRANSIT AND A LEVEL AND HAVE THEM LABEL THE PARTS AND INDICATE THEIR FUNCTION WITH ACCURACY REQUIRED TO PROPERLY SET UP AND OPERATE THE INSTRUMENTS.

4. HAVE THE STUDENTS DIAGRAM A ONE-FOOT SECTION OF EACH OF THE COMMONLY USED SURVEYING RODS AND HAVE THEM INDICATE WHEN EACH ROD SHOULD BE USED AND HOW THE NUMBERS ARE READ WITH ACCURACY REQUIRED OF A SOIL CONSERVATION AIDE.

5. HAVE EACH STUDENT SELECT A REAL OR IMAGINARY BENCHMARK IN THE FIELD, SET UP THE INSTRUMENT, TAKE A BACKSIGHT AND FORESIGHT, AND ESTABLISH A TURNING POINT USING CORRECT HAND SIGNALS WHEN NEEDED WITH ACCURACY REQUIRED TO PERFORM SURVEYING OPERATIONS.

6. HAVE EACH STUDENT RUN A BENCH LEVEL CIRCUIT WITH THE AMOUNT OF ALLOWABLE ERROR TO BE COMPUTED AS INDICATED IN THE CONSERVATION AIDE OR SIMILAR REFERENCES. HAVE A SOIL CONSERVATION SERVICE AIDE OR TECHNICIAN ASSIST IN THE EVALUATION IF CLASS SIZE REQUIRES EXTRA HELP OR INSTRUMENTS.

7. HAVE EACH STUDENT DETERMINE THE PERCENT SLOPE OF SEVERAL SLOPES USING A HAND LEVEL AND A PARTNER WITH THE LEVEL OF ACCURACY TO BE WITHIN ± 2%.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. HAND LEVELS
2. STEEL TAPES, 100' SURVEYOR'S
3. TRANSIT
4. DUMPY LEVELS
5. PLUMB BOBS
6. CHAINING PINS
7. RANGE POLES
8. PLANE TABLE AND ALIDADE
9. TARGET RODS
10. STADIA ROD
11. PROTRACTOR RULE
12. AX - SINGLE-BIT
13. BRUSH AX OR PRUNERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONSERVATION AIDE IV - SURVEYING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 83 PAGES.

   AN EXCELLENT AIDE FOR THE TEACHER AND THE STUDENT, THIS BOOKLET CONTAINS A STEP-BY-STEP EXPLANATION OF EACH TYPE OF CONSERVATION SURVEYING (DIFFERENTIAL LEVELING, PROFILE LEVELING, TOPOGRAPHIC SURVEYING.)

2. ENGINEERING FIELD MANUAL FOR CONSERVATION PRACTICES. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE. 1969, 600 PAGES.

   A TEACHER RESOURCE FOR TECHNICAL CONSERVATION SURVEYING INFORMATION.

3. SCHWAB, GLENN O., FREVERT, RICHARD K., BARNES, KENNETH K. AND EDMINSTER, TALCOTT W. ELEMENTARY SOIL AND WATER ENGINEERING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1965, 296 PAGES.

   A COLLEGE LEVEL TEXT VALUABLE AS A TEACHER AIDE FOR OBTAINING TECHNICAL SURVEYING INFORMATION WITH RELATED ENGINEERING PRACTICES.

VIII

WATER

U.S.O.E. CODE 01.06 05 00 00

WATER SUPPLY AND QUALITY DETERMINATION

IRRIGATION WATER MANAGEMENT

WATER SUPPLY AND QUALITY DETERMINATION

UNIT CONCEPT: WATER IS ONE OF OUR MOST VALUABLE NATURAL RESOURCES. ACCURATE DETERMINATION OF WATER SOURCES, DEMAND, QUALITY AND SOURCES OF POLLUTION WILL HELP DETERMINE THE METHODS THAT SHOULD BE USED TO ENSURE AN ADEQUATE SUPPLY OF HIGH QUALITY WATER.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WRITE A DESCRIPTION OF THE HYDROLOGIC CYCLE PROCESSES WHICH SHOULD INCLUDE PRECIPITATION, EVAPORATION, TRANSPIRATION AND CONDENSATION.

2. WHEN GIVEN A SPECIFIED LAND AREA, IDENTIFY THE AVAILABLE SURFACE WATER AND GROUND WATER SUPPLIES WHICH SHOULD INCLUDE WATERWAYS, WATER IMPOUNDMENTS AND AQUIFERS.

3. WHEN GIVEN A SPECIFIED COMMUNITY SIZE AND LOCATION, ESTIMATE THE ANNUAL, MONTHLY AND DAILY DEMAND FOR WATER TO THE SATISFACTION OF THE INSTRUCTOR.

4. USING WATER TEST KITS, DETERMINE THE QUALITY OF A GIVEN SAMPLE OF WATER WITHIN THE LIMITS OF THE TESTING EQUIPMENT.

5. WHEN GIVEN A SPECIFIED WATERSHED, IDENTIFY THE PRESENT AND POTENTIAL SOURCES AND TYPES OF WATER POLLUTION AND THEIR EFFECTS ON THE NATURAL RESOURCES OF THE AREA.

6. WHEN GIVEN A WATERSHED WITH IDENTIFIED WATER POLLUTION SOURCES, DETERMINE THE ALTERNATIVE METHODS WHICH COULD BE USED TO CORRECT THE PROBLEM TO MEET LOCAL AND/OR STATE POLLUTION REGULATIONS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE HYDROLOGIC CYCLE PROCESSES

   A. PRECIPITATION

   B. EVAPORATION

   C. TRANSPIRATION

D. CONDENSATION

2. DETERMINING AVAILABLE SURFACE WATER AND GROUND WATER SUPPLIES

A. MEASURING PRECIPITATION

B. DETERMINING FLOWING WATER SUPPLIES

C. DETERMINING WATER IMPOUNDMENT SUPPLIES

D. IDENTIFYING GROUND WATER SUPPLIES

(1) SPRINGS
(2) ARTESIAN WELLS
(3) DRILLED WELLS

3. ESTIMATING COMMUNITY DEMANDS FOR WATER

A. DETERMINING DEMAND FACTORS

(1) COMMUNITY SIZE
(2) LIVING STANDARDS
(3) CLIMATE
(4) WATER QUALITY

B. IDENTIFYING MAJOR WATER USERS

(1) DOMESTIC USAGE
(2) INDUSTRIAL USAGE
(3) AGRICULTURAL DEMANDS

4. EVALUATING WATER QUALITY

A. DETERMINING POTABILITY

(1) MICROORGANISMS
(2) TASTE
(3) ODOR

B. DETERMINING PHYSICAL QUALITY

(1) HARDNESS
(2) CORROSIVENESS
(3) COLOR

C. DETERMINING CHEMICAL QUALITY

D. IDENTIFYING NATURAL POLLUTANTS

E. IDENTIFYING MANUFACTURED POLLUTANTS

5. IDENTIFYING PRESENT AND POTENTIAL WATER POLLUTION SOURCES

   A. DOMESTIC POLLUTION

   B. AGRICULTURAL POLLUTION

   C. INDUSTRIAL POLLUTION

   D. IDENTIFYING EFFECTS OF POLLUTION

      (1) FISH
      (2) WILDLIFE
      (3) VEGETATION
      (4) RECREATIONAL WATER USAGE
      (5) WATER POTABILITY

6. IDENTIFYING METHODS OF WATER POLLUTION CONTROL

   A. WATERSHED MANAGEMENT AND PROTECTION

   B. DISPOSAL OF POLLUTANTS WITHOUT TREATMENT

      (1) DILUTION
      (2) IRRIGATION
      (3) LAGOONS

   C. TREATMENT METHODS

      (1) PRIMARY, SECONDARY AND TERTIARY METHODS
      (2) DISINFECTION AND DEODORIZATION
      (3) PRIVATE DISPOSAL SYSTEMS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE THE STUDENTS MAKE A TERRARIUM SO THAT THEY CAN OBSERVE MANY OF THE PROCESSES WHICH OCCUR DURING THE HYDROLOGIC CYCLE.

   B. SET UP A DEMONSTRATION USING SWEET POTATOES IN CONTAINERS OF WATER TO SHOW WATER LOSS THROUGH TRANSPIRATION. (THE POTATOES MUST HAVE SUNLIGHT.)

2. A. HAVE A SOIL CONSERVATION SERVICE REPRESENTATIVE DISCUSS SOURCES AND AMOUNTS OF WATER IN THE AREA.

   B. DETERMINE THE AVERAGE INCHES OF RAINFALL IN AN ACRE AREA AND CONVERT IT INTO GALLONS.

3. A. HAVE EACH STUDENT READ THE HOME WATER METER AT THE SAME TIME DAILY FOR 30 DAYS AND DETERMINE THE AVERAGE DAILY WATER CONSUMPTION FOR EACH FAMILY.

B. LOCATE THE THREE LARGEST USERS OF WATER IN THE COMMUNITY AND DETERMINE THEIR DAILY WATER REQUIREMENTS.

4. HAVE EACH STUDENT BRING IN A SAMPLE OF WATER FROM A WATERWAY, WATER IMPOUNDMENT OR HOME WATER SUPPLY AND TEST IT TO DETERMINE ITS QUALITY.

5. TAKE A FIELD TRIP TO A WATERSHED AND LOCATE POSSIBLE POLLUTION SOURCES. COLLECT SAMPLES FROM THESE SOURCES AND ANALYZE THEM.

6. HAVE THE STUDENTS IDENTIFY THE METHODS BEING USED IN THE COMMUNITY TO CONTROL WATER POLLUTION INCLUDING WASTEWATER TREATMENT INSTALLATIONS, WASTEWATER LAGOONS AND PRIVATE DISPOSAL SYSTEMS. ANALYZE EACH FOR THEIR EFFECTIVENESS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DIAGRAM THE HYDROLOGIC CYCLE AND DEFINE ALL TERMS THAT SHOULD BE INCLUDED.

2. ASSIGN THE STUDENTS A LAND AREA FOR WHICH THEY ARE TO CALCULATE THE VOLUME OF WATER FLOWING IN THE WATERWAYS AND THE AMOUNT OF WATER IN THE WATER IMPOUNDMENTS.

3. HAVE THE STUDENTS CALCULATE THE MONTHLY DEMAND FOR WATER IN A SPECIFIED COMMUNITY WHEN GIVEN THE NUMBER OF HOMES AND THEIR AVERAGE DAILY CONSUMPTION, THE NUMBER AND SIZE OF FARMS, AND ANY INDUSTRIAL USAGE.

4. FOR A GIVEN WATER SAMPLE PREVIOUSLY TESTED BY THE INSTRUCTOR, HAVE EACH STUDENT DETERMINE THE WATER QUALITY AND PRESENCE OF ANY POLLUTANTS. THE STUDENTS SHOULD BE EVALUATED FOR CORRECTNESS OF TECHNIQUE AND TEST RESULTS FOR WHICH SOME ERROR SHOULD BE EXPECTED.

5. DEVELOP A MATCHING TEST IN WHICH THE STUDENTS ARE TO MATCH DIFFERENT POLLUTANTS COMMONLY FOUND IN WATERSHEDS WITH THEIR MOST PROBABLE SOURCES.

6. GIVE THE STUDENTS HYPOTHETICAL SITUATIONS IN WHICH WATER POLLUTANTS AND THEIR SOURCES HAVE BEEN DEFINED. HAVE EACH STUDENT INDICATE THE METHODS WHICH COULD BE USED TO SOLVE THE PROBLEMS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. WATER TEST KITS - WATER QUALITY AND WATER POLLUTION

2. RAIN GAUGE

F. EXAMPLES OF SUPPORTING REFERENCES

1. PLANNING FOR AN INDIVIDUAL WATER SYSTEM. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1973, 156 PAGES.

   THIS BOOK CONTAINS INFORMATION CONCERNING WATER CONSUMPTION, DEVELOPMENT OF SAFE WATER SYSTEMS AND INSTALLATION OF DOMESTIC AND AGRICULTURAL WATER SYSTEMS.

2. A PRIMER ON GROUND WATER. WASHINGTON, D.C.: U.S. DEPARTMENT OF THE INTERIOR, U.S. GOVERNMENT PRINTING OFFICE. 1970, 26 PAGES.

   THIS PAMPHLET COVERS THE LOCATION AND CHARACTERISTICS OF AQUIFERS.

3. A PRIMER ON WATER. WASHINGTON, D.C.: U.S. DEPARTMENT OF THE INTERIOR, U.S. GOVERNMENT PRINTING OFFICE. 1960, 50 PAGES.

   THE BASIC PROPERTIES OF WATER AND CHARACTERISTICS OF WATERSHEDS ARE INCLUDED IN THIS PUBLICATION.

4. A PRIMER ON WATER QUALITY. WASHINGTON, D.C.: U.S. DEPARTMENT OF THE INTERIOR, U.S. GOVERNMENT PRINTING OFFICE. 1965, 27 PAGES.

   THIS PAMPHLET CONTAINS INFORMATION CONCERNING COMMON WATER POLLUTANTS, THEIR SOURCES AND CONTROL METHODS.

IRRIGATION WATER MANAGEMENT

UNIT CONCEPT: IN AREAS WHERE SUPPLEMENTAL WATER LEVELS ARE NEEDED, SKILLS AND KNOWLEDGE IN MANAGING IRRIGATION WATER ARE NECESSARY TO OBTAIN MAXIMUM CROP OR TURF PRODUCTION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIC LAND AREA IN NEED OF IRRIGATION FOR MAXIMUM CROP PRODUCTION, IDENTIFY THE MAJOR FACTORS WHICH SHOULD BE CONSIDERED BEFORE ESTABLISHMENT OF A WATER MANAGEMENT SYSTEM.

2. IDENTIFY THE COMMON IRRIGATION METHODS AND SYSTEMS IN HIS REGION AND EVALUATE THE FEASIBILITY OF THE DIFFERENT METHODS UNDER SPECIFIED FIELD CONDITIONS.

3. ESTIMATE THE VOLUME OF IRRIGATION WATER FLOWING THROUGH A SYSTEM WITHIN LIMITS SET BY THE INSTRUCTOR.

4. PRESCRIBE WHEN, HOW MUCH, AND HOW OFTEN TO IRRIGATE A SPECIFIC CROP UNDER A GIVEN SET OF FIELD CONDITIONS TO ACHIEVE THE DESIRED WATER LEVEL.

5. DETERMINE THE PROVISIONS IN LEGAL AGREEMENTS USED FOR ADMINISTERING AND ALLOTTING IRRIGATION WATER.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE FACTORS INVOLVED IN ESTABLISHING WATER MANAGEMENT SYSTEMS

   A. IDENTIFYING TYPES OF SOIL WATER

      (1) GRAVITATIONAL
      (2) CAPILLARY
      (3) HYGROSCOPIC

   B. IDENTIFYING METHODS OF WATER MOVEMENT

      (1) GRAVITY
      (2) CAPILLARY ACTION

C. IDENTIFYING ESTABLISHMENT FACTORS

(1) DETERMINING WATER SOURCES AND AMOUNTS AVAILABLE
(2) DETERMINING SOIL TYPES AND CHARACTERISTICS
(3) IDENTIFYING SOIL DRAINAGE CHARACTERISTICS
(4) DETERMINING TOPOGRAPHICAL EFFECTS
(5) IDENTIFYING CLIMATIC FACTORS
(6) DETERMINING THE EFFECTS ON CROPS
(7) DETERMINING ECONOMIC FACTORS

2. METHODS OF IRRIGATION

A. SPRINKLER

B. SURFACE

C. SUBSURFACE

3. SELECTING THE IRRIGATION SYSTEM

A. GRAVITY SYSTEMS

B. PRESSURE SYSTEMS

4. MEASURING IRRIGATION WATER

A. MEASURING WATER VOLUME FLOWING FROM PIPE WITH FREE FALL

B. MEASURING WATER VOLUME BY MEANS OF OPEN DITCH, WEIRS, OR METERS

C. MEASURING WATER VOLUME DISCHARGED THROUGH PRESSURE SPRINKLER SYSTEMS

D. DETERMINING LOSS OF HEAD IN OPEN AND CLOSED SYSTEMS

5. DETERMINING SOIL MOISTURE CONTENT

A. USING HAND TEST

B. USING TENSIOMETERS

C. USING ELECTRICAL RESISTANCE

D. USING DRY WEIGHT TEST

6. DETERMINING IRRIGATION TIME, QUANTITY, AND TIME INTERVAL

A. CONSIDERING SOIL CHARACTERISTICS

B. CONSIDERING PLANT CHARACTERISTICS

(1) DETERMINING PLANT AGE
(2) DETERMINING PLANT APPEARANCE
(3) DETERMINING TRANSPIRATION RATES

C. CONSIDERING CLIMATIC CONDITIONS

D. OPENING AND CLOSING IRRIGATION SYSTEMS

7. DETERMINING LEGAL AND ADMINISTRATIVE FACTORS

A. IDENTIFYING WATER RIGHTS

B. ADMINISTERING WATER USE

(1) DETERMINING PRIVATE NEEDS
(2) DETERMINING QUASI-PUBLIC AND PUBLIC NEEDS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. DEMONSTRATE THE MOVEMENT OF WATER THROUGH SOIL BY CAPILLARY ACTION BY INSERTING A GLASS TUBE HALFWAY DOWN ALONG THE EDGE OF A BEAKER FILLED WITH DRY SOIL AND SLOWLY ADDING WATER.

B. KILN DRY 100 GRAMS OF VISIBLY DRY SOIL AND RE-WEIGH TO DETERMINE THE PERCENT OF CAPILLARY AND HYGROSCOPIC WATER IN THE SOIL.

C. CONSULT AN IRRIGATION SPECIALIST TO DETERMINE COSTS OF INSTALLING AND OPERATING DIFFERENT IRRIGATION SYSTEMS.

D. USE A SOIL AUGER TO OBSERVE WATER PENETRATION IN THE SOIL.

2. TAKE FIELD TRIPS TO SEE COMMON IRRIGATION SYSTEMS AND TO DETERMINE THE SOURCES OF WATER, SYSTEMS OF MOVING WATER, AND SYSTEMS OF DISTRIBUTION.

3. PRACTICE MEASURING WATER FLOW IN DIFFERENT WATER DISTRIBUTION SYSTEMS BY USING THE MOST APPROPRIATE METHOD FOR EACH SYSTEM.

4. A. PRACTICE USING HAND TESTS TO DETERMINE SOIL MOISTURE CONTENT. CHECK RESULTS WITH A TENSIOMETER OR OTHER DEVICE WHEN POSSIBLE.

B. TAKE FIELD TRIPS TO OBSERVE PLANTS THAT HAVE RECEIVED TOO FREQUENT OR INFREQUENT IRRIGATION.

C. CALCULATE THE MONETARY LOSS FROM APPLYING FOUR INCHES TOO MUCH WATER TO FIVE ACRES OF A DESIGNATED FIELD CROP.

5. HAVE A SOIL CONSERVATION SERVICE REPRESENTATIVE OR A LEGAL AUTHORITY DISCUSS WITH THE STUDENTS THE LEGAL ASPECTS CONCERNING THE USE OF WATER FOR IRRIGATION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DETERMINE THE FEASIBILITY OF DEVELOPING AN IRRIGATION SYSTEM FOR A DESIGNATED CROP BY DETERMINING THE FACTORS INVOLVED IN ESTABLISHING AN IRRIGATION SYSTEM.

2. HAVE EACH STUDENT IDENTIFY AND EXPLAIN THE DIFFERENT IRRIGATION METHODS AND SYSTEMS.

3. HAVE EACH STUDENT MEASURE IRRIGATION WATER FLOWING IN A GRAVITY OR PRESSURE SYSTEM.

4. HAVE EACH STUDENT DETERMINE THE IRRIGATION TIME, QUANTITY, AND INTERVAL FOR A SPECIFIED FIELD BY CONSIDERING SOIL, PLANT, AND CLIMATIC CONDITIONS.

5. HAVE THE STUDENTS LIST THE LEGAL FACTORS USED IN ADMINISTERING WATER USE IN THEIR STATE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SCALES

2. BEAKERS

3. SOIL AUGER

4. TENSIOMETER

F. EXAMPLES OF SUPPORTING REFERENCES

1. KNUTI, LEO L., KORPI, MILTON AND HIDE, J. C. PROFITABLE SOIL MANAGEMENT. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1970, 376 PAGES.

   THIS TEXT CONTAINS THE SOILS INFORMATION COVERED IN THIS UNIT AS WELL AS AN OVERVIEW OF IRRIGATION PROCEDURES.

2. PLANNING FOR AN IRRIGATION SYSTEM. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1971, 112 PAGES.

   THIS BOOKLET IS AN EXCELLENT REFERENCE FOR SELECTION AND DEVELOPMENT OF IRRIGATION SYSTEMS.

IX

WILDLIFE
U.S.O.E. CODE 01.06 04 00 00

WILDLIFE IDENTIFICATION AND POPULATION MANAGEMENT

WILDLIFE POPULATION AND HABITAT SURVEYS

GAME BIRD PROPAGATION

WILDLIFE IDENTIFICATION AND POPULATION MANAGEMENT

UNIT CONCEPT: BECAUSE OF DISEASE, PREDATORS AND ENVIRONMENTAL CHANGES SOMETIMES CAUSED BY MAN, MANY WILDLIFE SPECIES CANNOT COMPETE OR ADAPT, WHICH OFTEN RESULTS IN REDUCTION OF THEIR POPULATION OR EXTINCTION. WISE MANAGEMENT OF WILDLIFE POPULATIONS ON PUBLIC AND PRIVATE LANDS WILL RESULT IN THE PRODUCTION OF HEALTHY, VIGOROUS WILDLIFE POPULATIONS FOR PUBLIC BENEFIT AND ENJOYMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING WILDLIFE IDENTIFICATION GUIDES AND/OR REFERENCES, IDENTIFY THE IMPORTANT BIRD AND ANIMAL SPECIES IN HIS REGION AND CLASSIFY THEM AS GAME, NON-GAME, NUISANCE OR ENDANGERED SPECIES.

2. USING THE NECESSARY MAPS, AERIAL PHOTOGRAPHS AND EQUIPMENT, OUTLINE AND IMPLEMENT PLANS FOR STIMULATING NATIVE AND INTRODUCED GAME POPULATIONS ON A DESIGNATED LAND AREA.

3. USING NECESSARY RESOURCE MATERIAL AND EQUIPMENT, IMPLEMENT A MANAGEMENT PLAN FOR A WILDLIFE REFUGE OR SANCTUARY.

4. IDENTIFY THE PRIVATE, STATE AND FEDERAL AGENCIES IN WILDLIFE CONSERVATION AND DETERMINE THE SERVICES AVAILABLE THROUGH EACH.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING WILDLIFE SPECIES

   A. IDENTIFYING BIRD SPECIES

      (1) IDENTIFYING UPLAND GAME SPECIES
      (2) IDENTIFYING WATERFOWL GAME SPECIES
      (3) IDENTIFYING PROTECTED BIRD SPECIES

         (A) BIRDS OF PREY
         (B) WATER BIRDS
         (C) SONG BIRDS
         (D) ENDANGERED SPECIES

(4) IDENTIFYING NUISANCE BIRDS

B. IDENTIFYING ANIMAL SPECIES

(1) IDENTIFYING GAME ANIMALS
(2) IDENTIFYING FUR BEARERS
(3) IDENTIFYING PROTECTED ANIMALS
(4) IDENTIFYING NUISANCE ANIMALS

2. MANAGING WILDLIFE POPULATIONS

A. INCREASING NATIVE GAME POPULATIONS

(1) PLANTING COVER AND FOOD CROPS
(2) DEVELOPING NESTING AREAS

B. INCREASING WILDLIFE NUMBERS THROUGH LAND MANAGEMENT PRACTICES

C. INCREASING GAME POPULATIONS THROUGH ARTIFICIAL METHODS

(1) RELEASING BIRDS AND ANIMALS
(2) IDENTIFYING LAWS AND REGULATIONS
(3) LIVE TRAPPING AND RE-RELEASING
(4) TAGGING AND BANDING BIRDS AND ANIMALS

D. DETERMINING THE EFFECTS OF PREDATORS ON POPULATIONS

3. MANAGING AND MAINTAINING WILDLIFE SANCTUARIES

A. DETERMINING LAWS AND REGULATIONS

B. DEVELOPING FOOD, COVER, AND WATER

C. CONTROLLING PREDATORS

D. OPERATING FACILITIES AND EQUIPMENT

E. MAINTAINING FACILITIES AND EQUIPMENT

F. DEVELOPING GOOD PUBLIC RELATIONS

4. IDENTIFYING PRIVATE AND GOVERNMENT WILDLIFE CONSERVATION AGENCIES

A. IDENTIFYING PRIVATE CONSERVATION AGENCIES

(1) LOCAL
(2) STATE
(3) NATIONAL

B. IDENTIFYING GOVERNMENT CONSERVATION AGENCIES

(1) STATE
(2) FEDERAL

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USE WILDLIFE PHOTOGRAPHY PROJECTS FOR WILDLIFE IDENTIFICATION.

B. BUILD AND STOCK BIRD FEEDERS AND HOUSES FOR BIRD OBSERVATION AND IDENTIFICATION.

2. SCHEDULE FIELD TRIPS TO OBSERVE WILDLIFE AND WILDLIFE MANAGEMENT TECHNIQUES.

3. DEVELOP A WILDLIFE AREA ON THE SCHOOL LAND LABORATORY TO DEMONSTRATE MANAGEMENT TECHNIQUES USED ON WILDLIFE SANCTUARIES OR REFUGES.

4. HAVE RESOURCE PERSONS FROM PRIVATE AND GOVERNMENT AGENCIES SPEAK TO STUDENTS ABOUT THEIR SERVICES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PREPARE SLIDES OR PICTURES OF THE ECONOMICALLY IMPORTANT WILDLIFE SPECIES IN THE STATE OR REGION FOR IDENTIFICATION BY THE STUDENTS. THE NUMBER OF SPECIES TO IDENTIFY SHOULD BE DETERMINED BY THE DEPTH OF THE COURSE AND/OR ABILITY OF THE STUDENTS.

2. HAVE THE STUDENTS LIST THE NATURAL AND ARTIFICIAL METHODS OF INCREASING THE WILDLIFE POPULATION THAT COULD BE USED ON A SPECIFIED LAND AREA. THE LIST SHOULD INCLUDE AT LEAST THREE NATURAL AND THREE ARTIFICIAL METHODS.

3. HAVE THE STUDENTS DEVELOP A MANAGEMENT PLAN FOR A SPECIFIED LAND AREA WHICH COULD BE USED AS A WILDLIFE REFUGE OR SANCTUARY. HAVE A STATE WILDLIFE EMPLOYEE ASSIST IN EVALUATION OF THE PLANS IF NECESSARY.

4. DEVELOP A MATCHING TEST IN WHICH THE STUDENTS WOULD MATCH PRIVATE AND GOVERNMENT WILDLIFE AGENCIES AND THE SERVICES THEY PERFORM. THE STUDENTS SHOULD HAVE LESS THAN 5% ERROR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. BINOCULARS
2. CAMERA
3. HAND AND SMALL POWER TOOLS FOR CLEARING LAND AND PLANTING COVER AND FOOD PATCHES
4. HAVAHART TRAPS
5. BANDING AND/OR TAGGING PLIERS AND ACCESSORIES

F. EXAMPLES OF SUPPORTING REFERENCES

1. BURGER, GEORGE V. PRACTICAL WILDLIFE MANAGEMENT. NEW YORK, NEW YORK: WINCHESTER PRESS. 1972, 218 PAGES.

   THIS BOOK WOULD BE A GOOD STUDENT RESOURCE FOR OBTAINING INFORMATION CONCERNING GENERAL WILDLIFE MANAGEMENT. THE APPENDIX CONTAINS PUBLIC AND PRIVATE SOURCES OF WILDLIFE INFORMATION AND ASSISTANCE.

2. COLLINS, HENRY HILL, JR. COMPLETE FIELD GUIDE TO AMERICAN WILDLIFE. NEW YORK, NEW YORK: HARPER AND ROWE PUBLISHERS, INC. 1959, 683 PAGES.

   THIS BOOK CONTAINS, IN CONDENSED FORM, IDENTIFICATION INFORMATION CONCERNING ALL THE VERTEBRATES FOUND NORTH OF NORTH CAROLINA AND EAST OF THE ROCKIES. IT IS COMPLETE, YET CONDENSED ENOUGH TO BE CARRIED INTO THE FIELD FOR PRACTICAL IDENTIFICATION USAGE.

3. MAKING LAND PRODUCE USEFUL WILDLIFE. BULLETIN NO. 2035. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1965.

   A PAMPHLET WHICH CONTAINS PRACTICAL INFORMATION FOR MANAGING CROPLAND, PASTURELAND, RANGELAND, WOODLAND, AND WILDLIFE LAND TO IMPROVE CONDITIONS FOR WILDLIFE.

4. A MANUAL OF WILDLIFE CONSERVATION. WASHINGTON, D.C.: THE WILDLIFE SOCIETY. 1971, 106 PAGES.

   THIS BOOK IS A VALUABLE SOURCE OF INFORMATION WHICH WILL PROVIDE A BROAD, BASIC UNDERSTANDING OF WILDLIFE CONSERVATION.

5. WILDLIFE IDENTIFICATION MATERIALS FROM STATE WILDLIFE OR CONSERVATION DEPARTMENT.

WILDLIFE POPULATION AND HABITAT SURVEYS

UNIT CONCEPT: ACCURATE COLLECTION AND ANALYSIS OF WILDLIFE CENSUS AND HABITAT DATA WILL PROVIDE A BASIS FOR WILDLIFE MANAGEMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIC WILDLIFE SPECIES TO DETERMINE POPULATION, SELECT AN APPROPRIATE CENSUS METHOD AND CONDUCT THE CENSUS IN SUCH A MANNER THAT AN ACCURATE DETERMINATION OF THE POPULATION WILL BE MADE.

2. WHEN GIVEN THE INSTRUMENTS COMMONLY USED IN TAKING A WILDLIFE CENSUS, CORRECTLY OPERATE AND MAINTAIN THEM SO THAT AN ACCURATE CENSUS IS TAKEN.

3. GRAPH AND ANALYZE WILDLIFE CENSUS DATA FROM PREVIOUSLY RECORDED FIELD NOTES WITH ACCURACY NEEDED TO MAKE THE INFORMATION EASILY UNDERSTOOD.

4. EVALUATE THE COVER DENSITY AND AVAILABLE WILDLIFE FOOD IN A DESIGNATED AREA WITH ACCURACY NEEDED TO DETERMINE THE WILDLIFE POPULATION THAT THE AREA COULD SUPPORT.

B. INSTRUCTIONAL AREAS

1. DETERMINING WILDLIFE POPULATIONS

   A. TAKING A TRUE CENSUS OF POPULATIONS

   B. ESTIMATING WILDLIFE POPULATIONS

      (1) SAMPLING METHODS

         (A) COMPLETE COUNT ON A SAMPLING AREA
         (B) STRIP CENSUS
         (C) ROAD CENSUS
         (D) PREVALENCE AND FREQUENCY METHOD

      (2) USING INDICES METHODS

         (A) NUMBER OF WILDLIFE IN RELATION TO AN ENVIRONMENTAL FEATURE

(B) NUMBER OF WILDLIFE CAUGHT
(C) NUMBER OF WILDLIFE HARVESTED
(D) ANIMAL SIGNS AND/OR EVIDENCE

(3) USING RECAPTURE METHOD
(4) USING HUNTING AND OTHER MORTALITY DATA

2. USING EQUIPMENT AND TECHNIQUES FOR MEASURING WILDLIFE POPULATIONS

A. OPERATING OPTICAL INSTRUMENTS

B. OPERATING ACOUSTICAL INSTRUMENTS

C. OPERATING RADIO-TRACKING INSTRUMENTS

D. USING RADIOISOTOPES

E. CAPTURING AND MARKING WILDLIFE

(1) USING BAITS AND SCENTS
(2) TRAPPING AND NETTING
(3) USING DRUGS
(4) HANDLING WILDLIFE
(5) METHODS OF MARKING BIRDS AND ANIMALS

(A) COLORING
(B) MUTILATING
(C) TAGGING

F. MAINTAINING WILDLIFE CENSUS-TAKING EQUIPMENT

4. ANALYZING AND PRESENTING DATA

A. TAKING FIELD NOTES

B. GRAPHING DATA

(1) FREQUENCY TABLES
(2) FREQUENCY POLYGONS
(3) HISTOGRAMS

C. ANALYZING DATA

(1) USING MEASURES OF CENTRAL TENDENCY

(A) MEAN
(B) MEDIAN
(C) MODE

(2) USING MEASURES OF VARIABILITY

(A) RANGE
(B) VARIANCE
(C) STANDARD DEVIATION

D. COMPARING DATA TO LOCAL REGIONAL AND STATE SURVEYS

5. DETERMINING FOOD AND COVER PRESENT

A. EVALUATING COVER DENSITY

(1) USING PHOTOGRAPHIC EVALUATION
(2) USING VISUAL ESTIMATION
(3) USING NUMBER OF STEMS PER SAMPLE AREA

B. EVALUATING AVAILABLE FOOD

(1) DETERMINING STEMS OR SEEDS PER SAMPLE AREA
(2) USING CLIPPING METHOD

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USE WILDLIFE OFFICERS AS RESOURCE PERSONS TO EXPLAIN METHODS AND TECHNIQUES OF WILDLIFE CENSUS TAKING AND HUNTING KILL DETERMINATION IN YOUR STATE.

2. OBSERVE OR ASSIST WILDLIFE OFFICERS IN CAPTURING, TAGGING AND RELEASING SPECIMENS OF WILDLIFE.

3. A. COLLECT DATA FROM A WEEKLY STRIP CENSUS OR ROAD CENSUS AND CONSTRUCT FREQUENCY TABLES, FREQUENCY POLYGONS AND HISTOGRAMS.

   B. USE WILDLIFE CENSUS DATA TO CALCULATE THE MEAN, MEDIAN, RANGE AND STANDARD DEVIATION FOR DIFFERENT SPECIES.

4. EVALUATE FOOD AND COVER CROP CONDITIONS FOR WILDLIFE IN DESIGNATED HABITATS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE THE STUDENTS AN ESSAY TEST IN WHICH THEY ARE TO DESCRIBE IN DEPTH THE PROCEDURES USED IN AT LEAST THREE METHODS OF TAKING A WILDLIFE CENSUS.

2. HAVE THE STUDENTS LIST AT LEAST FOUR DIFFERENT INSTRUMENTS USED IN WILDLIFE CENSUS-TAKING AND EXPLAIN HOW THEY SHOULD BE OPERATED AND MAINTAINED.

3. HAVE THE STUDENTS CONSTRUCT FREQUENCY TABLES, FREQUENCY POLYGONS, AND/OR HISTOGRAMS FROM DATA THEY HAVE COLLECTED OR FROM WILDLIFE DEPARTMENT DATA. EVALUATE THEIR WORK FOR NEATNESS AND ACCURACY.

4. ASSIGN A LAND AREA FOR THE STUDENTS TO CRUISE IN ORDER TO EVALUATE THE FOOD AND COVER CROP CONDITIONS PRESENT. HAVE A WILDLIFE OFFICER ASSIST IN EVALUATING THE STUDENTS AS TO PROPER USE OF CRUISING PROCEDURES AND THE RESULTS OF THE HABITAT EVALUATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. BINOCULARS

2. SMALL ANIMAL CAGES

3. SINGLE AND DOUBLE SPRING TRAPS

4. HAVAHART TRAPS

F. EXAMPLES OF SUPPORTING REFERENCES

1. A MANUAL OF WILDLIFE CONSERVATION. WASHINGTON, D.C.: THE WILDLIFE SOCIETY. 1971, 206 PAGES.

   THIS REFERENCE CONTAINS CHAPTERS PERTAINING TO WILDLIFE POPULATION DYNAMICS AND METHODS OF TAKING POPULATION AND HARVEST SURVEYS.

2. MOSBY, H. S. WILDLIFE INVESTIGATIONAL TECHNIQUES. WASHINGTON, D.C.: THE WILDLIFE SOCIETY. 1967.

   THIS REFERENCE WILL PROVIDE THE TEACHER INFORMATION CONCERNING THE METHODS OF MEASURING WILDLIFE POPULATIONS.

GAME BIRD PROPAGATION

UNIT CONCEPT: THE DEMAND FOR GAMEBIRDS IS INCREASING DUE TO INCREASED INTEREST IN SHOOTING PRESERVES, RESTOCKING POPULATIONS IN NATURAL AREAS, AND USE OF GAMEBIRDS AS A FOOD ITEM. DEVELOPMENT OF COMPETENT PROPAGATION, RAISING, AND MARKETING TECHNIQUES WILL RESULT IN HEALTHY, VIGOROUS GAMEBIRDS AND INCREASED PROFITS FOR PROPAGATORS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY AND SELECT A SPECIES OF GAMEBIRDS TO PROPAGATE THAT AN ECONOMIC EVALUATION INDICATES WOULD BE PROFITABLE.

2. GIVEN THE SPECIES AND DESIRED NUMBER OF BIRDS TO BE PROPAGATED, DEVELOP A BREEDING, REPRODUCTION, AND INCUBATION PROGRAM THAT WILL PRODUCE GAMEBIRDS WITH LESS THAN 10% LOSS.

3. CARRY OUT A PLAN FOR BROODING A DESIGNATED SPECIES OF GAMEBIRDS WHICH WILL RESULT IN A MINIMUM LOSS OF BIRDS.

4. DEVELOP A FEEDING SYSTEM AND BALANCE RATIONS FOR A GIVEN LOT OF GROWING BIRDS AND BREEDERS WHICH WILL MAXIMIZE GAINS PER POUND OF FEED AND MINIMIZE WASTAGE.

5. PRESCRIBE AND IMPLEMENT A PLAN FOR PREVENTING AND/OR CURING COMMON DISEASES AND PARASITES WHICH AFFLICT GAMEBIRDS TO MINIMIZE LOSSES DURING BROODING AND GROWTH.

6. USING SPECIAL CRATES AND CATCHING NETS, HANDLE AND TRANSPORT GAMEBIRDS IN A MANNER WHICH WILL PREVENT INJURY AND FEATHER LOSS.

B. INSTRUCTIONAL AREAS

1. SELECTING THE SPECIES TO PROPAGATE

   A. IDENTIFYING GAMEBIRD SPECIES AND CHARACTERISTICS

   B. DETERMINING SOURCES OF EGGS OR CHICKS

C. DETERMINING MARKET DEMAND

D. EVALUATING COSTS AND RETURNS

(1) FIXED COSTS
(2) VARIABLE COSTS
(3) GROSS RETURNS
(4) NET RETURNS

2. BREEDING AND REPRODUCTION METHODS

A. IDENTIFYING THE PARTS OF THE REPRODUCTIVE SYSTEM OF MALE AND FEMALE BIRDS

B. IDENTIFYING MATING SYSTEMS

(1) PURPOSES OF OUTBREEDING
(2) PURPOSES OF INBREEDING
(3) PURPOSES OF CROSSBREEDING
(4) PURPOSES OF LINE BREEDING

C. INCUBATING GAMEBIRD EGGS

(1) CONTROLLING LIGHT
(2) CONTROLLING HEAT
(3) CONTROLLING HUMIDITY

3. BROODING AND REARING GAMEBIRDS

A. SELECTING THE HOUSING AND EQUIPMENT

(1) DETERMINING THE TYPES AND SIZES OF HOUSING NEEDED
(2) SELECTING THE VENTILATION SYSTEM
(3) DETERMINING INSULATION REQUIREMENTS
(4) SELECTING THE LIGHTING, WATERING, AND FEEDING SYSTEMS
(5) MAINTAINING THE HOUSING AND EQUIPMENT

B. MANAGING THE BROODER

(1) DETERMINING TEMPERATURE REQUIREMENTS
(2) DETERMINING FLOOR AND WATER SPACE REQUIREMENTS
(3) DETERMINING LITTER REQUIREMENT
(4) DEVELOPING THE FEEDING SYSTEM

4. FEEDING GAMEBIRDS

A. IDENTIFYING THE DIGESTIVE SYSTEM PARTS AND THEIR FUNCTIONS

B. IDENTIFYING THE SIX CLASSES OF NUTRIENTS, THEIR FUNCTIONS AND SOURCES

C. IDENTIFYING GAMEBIRD NUTRIENT REQUIREMENTS

(1) CHICKS
(2) GROWING POULTS
(3) BREEDERS

D. FORMULATING RATIONS

(1) DETERMINING AVAILABILITY AND COSTS OF FEEDS
(2) DETERMINING NUTRITIONAL VALUE
(3) DETERMINING PALATABILITY AND EASE OF FEEDING

5. CONTROLLING DISEASES

A. IDENTIFYING AND CONTROLLING CONTAGIOUS AND NON-CONTAGIOUS INFECTIOUS DISEASES

(1) RECOGNIZING SYMPTOMS
(2) DETERMINING CAUSES
(3) IDENTIFYING PREVENTION TECHNIQUES
(4) PRESCRIBING TREATMENT AND CONTROL

B. IDENTIFYING NON-INFECTIOUS DISEASES

(1) IDENTIFYING NUTRITIONAL DISEASES

(A) RECOGNIZING SYMPTOMS
(B) DETERMINING CAUSE
(C) IDENTIFYING PREVENTION TECHNIQUES
(D) PRESCRIBING TREATMENT

(2) IDENTIFYING TRAUMAS
(3) IDENTIFYING INHERITED DISEASES AND DEFECTS

C. IDENTIFYING AND CONTROLLING PARASITES

(1) IDENTIFYING INTERNAL PARASITES

(A) RECOGNIZING THE SYMPTOMS
(B) DETERMINING PREVENTION TECHNIQUES
(C) PRESCRIBING TREATMENT AND CONTROL

(2) IDENTIFYING EXTERNAL PARASITES

(A) RECOGNIZING THE PROBLEM
(B) DETERMINING PREVENTION TECHNIQUES
(C) PRESCRIBING TREATMENT AND CONTROL

D. MAINTAINING SANITATION

(1) CONTROLLING MOISTURE

(2) DISINFECTING
(3) MAINTAINING PROPER LITTER

6. HANDLING AND TRANSPORTING GAMEBIRDS

A. CATCHING THE BIRDS

B. HANDLING BIRDS

C. PROTECTING BIRDS DURING TRANSPORTATION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USE SLIDES, MOUNTS, MOVIES, AND FIELD TRIPS FOR GAME-BIRD IDENTIFICATION.

2. A. DISSECT A MALE AND FEMALE BIRD AND DRAW AND LABEL THE PARTS OF THE REPRODUCTIVE SYSTEMS.

B. HATCH GAMEBIRD EGGS IN THE CLASSROOM WITH AN INCUBATOR AND RAISE THE BIRDS ON THE SCHOOL LAND LABORATORY OR ON A CLASS MEMBER'S LAND.

3. TAKE FIELD TRIPS TO GAME FARMS TO OBSERVE FACILITIES USED FOR BROODING AND REARING GAMEBIRDS.

4. A. DISSECT A BIRD'S DIGESTIVE SYSTEM AND DRAW AND LABEL THE PARTS.

B. PRACTICE FORMULATING RATIONS FOR CHICKS AND GROWING POULTS.

5. USE A RESOURCE PERSON TO EXPLAIN DISEASE SYMPTOMS IN LIVE BIRDS AND ASSIST THE STUDENTS IN PERFORMING A POST-MORTEM EXAMINATION.

6. RELEASE THE GAME BIRDS PRODUCED IN A PREVIOUS ACTIVITY WHEN THEY ARE OF APPROPRIATE MATURITY UNDER SUPERVISION OF WILDLIFE OFFICERS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT PREPARE A BUDGET FOR RAISING A SELECTED SPECIES AND NUMBER OF GAMEBIRDS FROM INCUBATION TO MARKET. THE BUDGET SHOULD CONTAIN FIXED AND VARIABLE COSTS AS WELL AS GROSS AND NET RETURNS.

2. HAVE THE STUDENTS IDENTIFY THE PARTS OF THE MALE AND FEMALE REPRODUCTIVE SYSTEMS OF GAMEBIRDS ON DIAGRAMS PREPARED BY THE INSTRUCTOR.

3. SPECIFY A SPECIES AND NUMBER OF GAMEBIRDS FOR WHICH THE STUDENTS ARE TO INDICATE THE HOUSING REQUIREMENTS, SPACE REQUIREMENTS, AND OTHER ENVIRONMENTAL CONDITIONS THAT WOULD BE NEEDED TO PROMOTE THE BIRDS' HEALTH AND VIGOR.

4. HAVE THE STUDENTS DEVELOP A SUITABLE RATION FOR A SPECIES OF GAMEBIRDS AT A DESIGNATED AGE. THE RATION SHOULD BE EVALUATED AS TO ITS NUTRITIONAL VALUE, COST, AND PALATIBILITY.

5. DEVELOP A MATCHING TEST IN WHICH THE STUDENTS WILL MATCH COMMON GAMEBIRD DISEASES WITH THEIR CAUSE, VECTOR, PREVENTION METHODS, OR CURE.

6. HAVE THE STUDENTS LIST THE SAFETY PRECAUTIONS THEY SHOULD USE WHEN HANDLING AND TRANSPORTING GAMEBIRDS TO PREVENT INJURY OR FEATHER LOSS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. REFRIGERATOR
2. DISSECTING TRAYS AND KITS
3. TISSUE FORCEPS
4. THUMB FORCEPS
5. WIRE MESH STRAINERS
6. RUBBER APRONS
7. DEMONSTRATION INCUBATOR BROODER
8. HOUSING, PENS, AND EQUIPMENT FOR RAISING GAMEBIRDS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CATALOGUE OF GAME BREEDING INFORMATION. CURRENT EDITION. RIVERSIDE, CALIFORNIA: NATIONAL SHOOTING SPORTS FOUNDATION.

2. MANAGING GAMEBIRDS. BULLETIN NO. 3-692. EAST LANSING, MICHIGAN: EXTENSION SERVICE, MICHIGAN STATE UNIVERSITY. 1972, 15 PAGES.

THIS PAMPHLET CONTAINS INFORMATION CONCERNING EACH TOPIC IN THIS UNIT PLUS SUGGESTED SOURCES OF INFORMATION AND ASSISTANCE.

APPENDIX A

Recommended Materials or Equipment

THIS LIST OF EQUIPMENT CAN BE USED AS A GUIDE IN ORDERING AND ASSEMBLING THOSE ITEMS NEEDED. MANY STATE DEPARTMENTS HAVE MORE DEFINITIVE LISTS AVAILABLE AND IT MAY BE WELL TO REQUEST THESE AS ADDITIONAL SOURCES OF INFORMATION. IN ADDITION, EXPERIENCE CAN BE AN IMPORTANT FACTOR IN DETERMINING EQUIPMENT NEEDS.

SUGGESTED LAND LABORATORY EQUIPMENT LIST

ABNEY LEVEL
ACREAGE GRIDS
AERIAL PHOTOGRAPH INTERPRETATION GRIDS
ANIMAL TRAPS (LIVE)
ANIMAL CAGES (SMALL)
AXES, HAND (MATTOCK AXE, OREGON MAUL, BUSH AXE)
AXES, SINGLE AND/OR DOUBLE BIT
BINOCULARS
BLOCK AND TACKLE - WIRE STRETCHER WITH CLAMPS
BOAT, 14' OR LARGER
BUCK SAWS - 25"
CALCULATOR
CAMERA
CANT HOOKS
CHAIN SAWS - 16" BLADES
CHAIN, SURVEYOR'S
CHOKERS - 1/8", 2 SLIPHOOKS, 6' LENGTH
CHRISTMAS TREES AND EVERGREEN SHEARING KNIVES
CROSS-CUT SAWS
CRUISER STICKS
DEPTH METER, WATER
DIAMETER TAPES
DISSECTING TRAYS AND KITS
DRAFTING AND DRAWING INSTRUMENTS
FARRIER EQUIPMENT
FILES (ASSORTED) - ROUND AND FLAT
FIRE BEATERS
FIRE RAKES
FIRST AID KITS
FISHING EQUIPMENT, SPINNING AND CASTING
FISH TAGGING PLIERS AND TAGS
GASOLINE CONTAINERS
GEOLOGIST PICKS
GRAFTING AND BUDDING EQUIPMENT
HAND COMPASSES
HAND LENSES

HAND LEVELS
HARD HATS
HOES, GARDEN
HOSE, WATER
INCREMENT BORERS
INCUBATOR-BROODER (100-CHICK)
INSECT EXHIBIT CASE
INSECT KILLING JARS (NON-POISONOUS)
INSECT NETS
INSECT SPREADING BOARD
LAWN MOWERS, PUSHING AND RIDING
LAWN SEEDER AND/OR SPREADER
LEG PROTECTORS
LIFE JACKETS
LIVESTOCK GROOMING EQUIPMENT
LOGGING CHAINS
MATTOCKS
MECHANICAL COUNTER
MICROSCOPES
PARRALLAX WEDGES
PINS (TAPING), SURVEYOR'S
PLANKTON NET
PLANTING BARS
PLUMB BOBS
POST HOLE DIGGER
PRUNNERS - LARGE, HAND
PRUNING SAWS
PRUNING SHEARS
RAKES, GARDEN
RANGE POLES
RIFLE - 22 CALIBER SINGLE SHOT TARGET
ROPE ROTOTILLER
SAFETY SADDLES
SAW FILING AND SETTING KITS
SCYTHES
SECCHI DICS
SEINE - 8' TO 10' X 4' X 1/8"
SEINE - 25' X 6' X 1/4" WITH BAG
SHARPENING STONES (VARIED TYPES)
SHOVELS
SICKLES
SLEDGE HAMMERS
SOIL ANALYSIS SIEVES
SOIL AUGER
SOIL MOISTURE METER
SOIL PH TEST KIT
SOIL PROBES
SOIL THERMOMETER
SNAKE BITE KITS
SPADES

LAND LABORATORY EQUIPMENT (CONTINUED)

SPRAYERS, HERBICIDE AND BRUSH KILLER - 5 GALLON
SPRAYERS - BACK-PACK WATER SPRAYER FOR FIRE
STEEL SPRING TRAPS
STEEL TAPES - 100'
STEREOSCOPES, POCKET
SURVEYING RODS
SURVEYOR'S STAFF COMPASS
TRACTOR, FARM

- BLADE
- BRUSH HOG
- CULTIVATOR
- DISC
- MOWER
- PLOW
- SCOOP
- TRAILER, 2-WHEEL
- OTHER ALLIED EQUIPMENT

TRANSITS
TREE CALIPERS
TREE CLIMBERS
TREE CLIMBING ROPES AND SNAPS
TREE INJECTOR - BRUSH KILLER APPLICATOR
TREE MARKING GUNS
TREE SEEDER
TREE TRIMMER AND SAW WITH POLES
WATER POLLUTION TEST KIT
WATER SAMPLER
WATER TEST KIT
WEATHER RECORDING EQUIPMENT
WEDGES, FELLING AND SPLITTING
WET STONE
WHEELBARROWS

SUGGESTED INDOOR LABORATORY EQUIPMENT

CARPENTRY TOOLS

- ANVIL
- CROW BARS
- HAMMERS
- HAND SAWS (RIP AND CROSSCUT)
- MEASURING TAPES
- PAINT BRUSHES
- SQUARES
- WRECKING BARS

INDOOR LABORATORY EQUIPMENT (CONTINUED)

HAND TOOLS FOR ENGINE AND EQUIPMENT MAINTENANCE

- BOLT CUTTER
- CHISELS, COLD
- HACK SAWS
- HYDRAULIC JACK
- IGNITION TOOL KIT
- MACHINIST VISE
- PLIERS AND VISE GRIPS
- PUNCHES
- SCREWDRIVERS - STANDARD, PHILLIPS
- SOCKET SETS
- TROUBLE LAMPS WITH EXTENSION CORD REELS
- WIRE BRUSHES
- WORK BENCHES AND VISES
- WRENCHES - OPEN END, BOX END

MASONRY EQUIPMENT

- CONCRETE EDGERS
- CONCRETE MIXING TUBS
- TROWELS

METAL-WORKING EQUIPMENT

- ELECTRIC ARC WELDER AND ACCESSORIES
- OXY-ACETYLENE TORCH AND ACCESSORIES

POWER EQUIPMENT

- AIR COMPRESSOR AND ATTACHMENTS
- DRILL PRESS
- ELECTRIC CIRCULAR SAW
- ELECTRIC DRILLS
- GRINDERS
- JOINTER
- POWER HACK SAW
- SAWS - BAND, RADIAL

SAFETY EQUIPMENT

- GLOVES
- GOGGLES, SAFETY
- WELDING GOGGLES, ACETYLENE
- WELDING HELMETS

APPENDIX B

Suggested References for Instructional Units

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APPENDIX C

Selected List of Professional and Technical Societies and Organizations Concerned with Agricultural Resources and its Application

INCLUSION OR OMISSION OF AN ORGANIZATION OR SOCIETY IN THIS LIST DOES NOT IMPLY APPROVAL OR DISAPPROVAL OF IT. ADDITIONAL INFORMATION REGARDING LOCAL CHAPTERS OR SECTIONS OF THESE ORGANIZATIONS OR SOCIETIES MAY BE OBTAINED BY WRITING DIRECTLY TO THE EXECUTIVE SECRETARY AT THE LISTED ADDRESS.

AMERICAN CONGRESS ON SURVEYING AND MAPPING, 733 15TH STREET, N.W., WASHINGTON, D.C. 20005

AMERICAN FISHERIES SOCIETY, 1040 WASHINGTON BUILDING, 15TH AND NEW YORK AVENUES, N.W., WASHINGTON, D.C. 20005

AMERICAN FOREST INSTITUTE, 1835 K STREET, N.W., WASHINGTON, D.C. 20006

AMERICAN FOREST PRODUCTS INDUSTRIES. 1816 N STREET, N.W., WASHINGTON, D.C. 20006

THE AMERICAN FORESTRY ASSOCIATION, 1319 18TH STREET, N.W., WASHINGTON, D.C. 20036

AMERICAN GEOLOGICAL INSTITUTE, 2201 M STREET, N.W., WASHINGTON, D.C. 20037

AMERICAN INSTITUTE OF PLANNERS, 917 15TH STREET, N.W., WASHINGTON, D.C. 20005

AMERICAN METEOROLOGICAL SOCIETY, 45 BEACON STREET, BOSTON, MASSACHUSETTS 02128

AMERICAN PETROLEUM INSTITUTE, 1271 AVENUE OF THE AMERICAS, NEW YORK, NEW YORK 10020

AMERICAN PLYWOOD ASSOCIATION, 1119 A STREET, TACOMA, WASHINGTON 08401

AMERICAN PULPWOOD ASSOCIATION, 605 THIRD AVENUE, NEW YORK, NEW YORK 10016

AMERICAN SOCIETY OF PHOTOGRAMMETRY, 644 LEESBURG PIKE, FALLS CHURCH, VIRGINIA 22044

AMERICAN WATER RESOURCES ASSOCIATION, P. O. BOX 434, URBANA, ILLINOIS 61801

ASSOCIATION OF INTERPRETIVE NATURALISTS, 1251 EAST BROAD STREET, COLUMBUS, OHIO 43205

CONSERVATION EDUCATION ASSOCIATION, BOX 450, MADISON, WISCONSIN 53701

ECOLOGICAL SOCIETY OF AMERICA, OAK RIDGE NATIONAL LABORATORY, RADIATION ECOLOGY DIVISION, OAK RIDGE, TENNESSEE 37831

ENTOMOLOGICAL SOCIETY OF AMERICA, 5603 CALVERT ROAD, COLLEGE PARK, MARYLAND 20740

INSTITUTE OF ENVIRONMENTAL SCIENCES, 34 SOUTH MAIN STREET, MT. PROSPECT, ILLINOIS 60057

NATIONAL AUDUBON SOCIETY, 1130 FIFTH AVENUE, NEW YORK, NEW YORK 10028

NATIONAL COAL ASSOCIATION, COAL BUILDING, 1130 SEVENTEENTH STREET, N.W., WASHINGTON, D.C. 20036

NATIONAL PARKS AND CONSERVATION ASSOCIATION, 1701 18TH STREET, N.W., WASHINGTON, D.C. 20009

NATIONAL RECREATION AND PARK ASSOCIATION, 1700 PENNSYLVANIA AVENUE, N.W., WASHINGTON, D.C. 20006

NATIONAL RIFLE ASSOCIATION, 1600 RHODE ISLAND AVENUE, WASHINGTON, D.C. 20036

NATIONAL SHOOTING SPORTS FOUNDATION, INC., 1075 POST ROAD, RIVERSIDE, CONNECTICUT 06878

NATIONAL WILDLIFE FEDERATION, 1412 16TH STREET, N.W., WASHINGTON, D.C. 20036

THE SOCIETY OF AMERICAN FORESTERS, SUITE 300, 1010 16TH STREET, N.W., WASHINGTON, D.C. 20036

SOCIETY FOR RANGE MANAGEMENT, 2120 SOUTH BIRCH STREET, DENVER, COLORADO 80222

SOIL CONSERVATION SOCIETY OF AMERICA, INC., 7515 N.E. ANKENY ROAD, ANKENY, IOWA 50021

SOIL SCIENCE SOCIETY OF AMERICA, 677 SOUTH SEGOE ROAD, MADISON, WISCONSIN 53711

WATER POLLUTION CONTROL FEDERATION, 3900 WISCONSIN AVENUE, WASHINGTON, D.C. 20016

WESTERN WOOD PRODUCTS ASSOCIATION, YEON BUILDING, PORTLAND, OREGON 97204

THE WILDERNESS SOCIETY, 729 15TH STREET, N.W., WASHINGTON, D.C. 20005

WILDLIFE MANAGEMENT INSTITUTE, 709 WIRE BUILDING, WASHINGTON, D.C. 20025

THE WILDLIFE SOCIETY, SUITE S-176, 3900 WISCONSIN AVENUE, N.E., WASHINGTON, D.C. 20016

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